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ICCS

THE INTERNATIONAL CONFERENCE ON CLIMATE SERVICES

DECEMBER 4-6, 2013
MONTEGO BAY CONVENTION CENTRE
MONTEGO BAY, JAMAICA

CONFERENCE REPORT


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ONLINE RESOURCES

Conference webpage & blog	Twitter	Climate Services Partnership website	Flickr
bit.ly/ICCS-3	twitter.com/#iccs3	climate-services.org	bit.ly/ICCS3-photos

ACRONYMS

ACDI/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance
APCC	Austrian Panel on Climate Change
CAMI	Caribbean Agrometeorological Initiative
5Cs	Caribbean Community Climate Change Center
CMCC	Centro Euro-Mediterraneo sui Cambiamenti Climatici
CARIWIN	Caribbean Water Initiative
CCA	climate change adaptation
CCAFS	Climate Change Agriculture and Food Security
CCCA	Climate Change Center, Austria
CCRA	Climate Change Risk Atlas
CCCCC	Caribbean Community Climate Change Centre
CCORAL	Caribbean Online Risk and Adaptation Tool
CDEMA	Caribbean Disaster and Emergency Management Agency
CDPMN	Caribbean Drought and Precipitation Monitoring Network
CERMES	Centre for Resource Management and Environmental Studies
CGIAR	Consultative Group for International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIMH	Caribbean Institute for Meteorology and Hydrology
CLIM RUN	Climate Local Information in the Mediterranean Responding to User Needs
COIN	Cost of Inaction Project, Austria
CPT	Climate Predictability Tool
CRiSTAL	Community-Based Risk Screening Tool
CRM	climate risk management
CSAG	Climate Systems Analysis Group, University of Cape Town
CSC	Climate Service Center, Germany
CSP	Climate Services Partnership
CSIRO	Commonwealth Scientific and Industrial Research Organization
DEWIS	drought early warning information system
DfID	UK Department for International Development
DHM	Department of Hydrology and Meteorology, Nepal
DPSEEA	Driving forces, Pressures, State, Exposure, Effect (health problems), and Action model
DRR	disaster risk reduction
DEYSCO	Decision Support System for Coastal Climate Change Impact Assessment
DSSAT	Decision Support System for Agrotechnology Transfer
E3	Economic Growth, Education, and Environment Bureau, United States Agency for International Development
ECSP	European Climate Services Partnership
EU	European Union
FP7	Seventh Framework Programme, European Union
GCM	global circulation model
GFCS	Global Framework for Climate Services
GIZ	Gesellschaft fur Internationale Zusammenarbeit
GLEAN	Global Leptospirosis Environmental Action Network
HCF	Health and Climate Foundation
HED	Higher Education for Development
HZG	Helmholtz-Zentrum Geesthacht

IBCS	Inter-governmental Board on Climate Services
IC3	Catalan Institute of Climate Sciences
ICCS	International Conference on Climate Services
ICEM	International Conference on Energy and Meteorology
ICI	International Climate Initiative
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
IRAP	International Research and Applications Project
IRI	International Research Institute for Climate and Society
JaREECH	Jamaica Rural Economy and Ecosystem Adapting to Climate Change
JPI	Joint Programming Initiative
LERG	Leptosprosis Burden Epidemiology Reference Group
M&E	monitoring and evaluation
MERIT	Meningitis Environmental Risk Information Technologies
MOS	model output statistic
MWLECC	Ministry of Water, Land, Environment, and Climate Change, Jamaica
NACSP	North American Climate Services Partnership
NCAR	US National Center for Atmospheric Research
NIDIS	US National Integrated Drought Information System
NOAA	US National Oceanic and Atmospheric Administration
PAHO	Pan-American Health Organization
PCR	principal components regression
PDIPC	Climate Information Development and Forecasting Project, Niger
PPCR	Pilot Programme for Climate Resilience
PSD	Prevention of Significant Deterioration
QGIS	Quantum Geographic Information Systems
R&D	research and development
RADA	Rural Agricultural Development Agency, Jamaica
RCOF	Regional Climate Outlook Forum
RIMES	Regional Integrated Multi-Hazard Early Warning System for Africa and Asia
SIDS	small island developing states
SPCR	Strategic Program for Climate Resilience
SPI	standardized precipitation index
UCAR	University Corporation for Atmospheric Research
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
UWI	University of the West Indies
WCRP	World Climate Research Programme
WEAP	Water Evaluation and Planning System
WHO	World Health Organization
WMO	World Meteorological Organization

WELCOMING CEREMONY

Opening Remarks

Jeffrey Spooner
Director, Meteorological Service of Jamaica

Jeffrey Spooner welcomed participants to the third International Conference on Climate Services (ICCS 3), reminding the audience that Jamaica originally offered to host this conference at the second ICCS in Brussels. Spooner suggested that this conference would shift the focus of the climate services conversation to the developing world and to small island developing states (SIDS). He noted this is particularly important as climate services are weakest in areas that need them most. Spooner underscored his hope that Jamaica will use the conference opportunity to build world-class climate services that benefit a range of sectors.

Welcome to the City

Glendon Harris
Mayor, Montego Bay

Glendon Harris welcomed the participants to the conference and reminded them of the importance of climate change to the Caribbean and, in particular, to Jamaica. He underscored the role of climate services in decision-making processes that lead to better adaptation policies related to climate impacts. Finally, Harris effusively invited the audience to enjoy Montego Bay.

Greetings

Jeanette Vail
Acting Mission Director
United States Agency for International Development /Jamaica

In her greetings, Jeanette Vail reported that the United States Agency for International Development (USAID) is providing assistance in global climate services, as evidenced by the fact that ICCS 3 was partially funded by USAID's Bureau for Economic Growth, Education, and Environment. In Jamaica, USAID is working on new climate change policy that will address the inclusion of climate change considerations in all development and planning priorities at the regional, national, and local levels.

USAID Jamaica has implemented a low-emissions strategies-and-capacities program that links community activities with national plans. Jamaican youth have been participating in climate change workshops as an action-oriented approach to reducing community-identified vulnerabilities. The workshops ultimately aim to support young people in becoming become global actors in the face of climate change by first driving action in their communities.

Vail stressed, however, that better access to climate information is fundamental in making long-term development improvements. She encouraged ICCS partners to explore linkages and build multi-agency collaborations that seek solutions to global challenges.

Keynote

Robert Pickersgill
Minister of Parliament
Ministry of Water, Land, Environment, and Climate Change, Jamaica

Robert Pickersgill opened his remarks by stressing that the conference would be very important for developing countries and for SIDS, which are particularly vulnerable to climate variability and change. He explained that the conference also posed an opportunity to build capacity and improve the use of climate information for decision making.

Pickersgill described the Caribbean region as a climate change hotspot and stressed the importance of addressing the need for climate services and informed decision-making. This is particularly true, he said, because the primary economic activities in the Caribbean region (e.g., agriculture, tourism) are very climate sensitive. In today's context, climate and extremes impact everyone, but those in developing countries are especially affected. Climate services are most lacking in areas that most need them, but there are opportunities to minimize risks and take advantage of opportunities. He added that Jamaica needs better climate services, especially to help manage its coasts.

Pickersgill stressed that Jamaica supports the development of adaptation strategies based on reliable climate information and science. Jamaica has many climate change departments, programs, and ongoing initiatives, all of which he said can contribute to improving quality of life throughout the country.

OPENING CEREMONY

Welcome from the Climate Services Partnership

Stephen Zebiak
International Research Institute for Climate and Society

Stephen Zebiak gave a warm welcome to conference participants on behalf of the Climate Service Partnership (CSP) and thanked both the hosts and local authorities. He introduced the overall goals and intended trajectory of the CSP, and briefly explained what was achieved in the two previous International Conferences on Climate Services. Zebiak emphasized the importance of more active end-user involvement and presented the conference roadmap, structure, and focus areas: research, stakeholder engagement, investment, capacity building, and best practices.

Climate services in the Caribbean

David Farrell
Caribbean Institute for Meteorology and Hydrology

David Farrell explained that the Caribbean Institute for Meteorology and Hydrology (CIMH) functions as the World Meteorological Organization (WMO) Regional Climate Centre for the Caribbean, collecting and providing meteorological and hydrological data. The objective of CIMH is to promote and organize climate services for its 16 member states, which are primarily in the English-speaking Caribbean. CIMH also maintains close working relationships with other regional organizations (e.g., the Caribbean Community Climate Change Centre [5Cs] and the Caribbean Disaster Emergency Management Agency [CDEMA] to provide climate services and inform policies that contribute to long-term disaster risk reduction within the Caribbean).

In his presentation, Farrell explained that in 2007, CIMH services expanded to include applied meteorology and climatology. This expansion allowed for the development of drought early warning systems and precipitation outlooks for the region. In 2011, CIMH also began consideration of the Global Framework for Climate Services (GFCS) to transition applied meteorology and hydrology to product services and development. Farrell reiterated that climate-related risks challenge sustainable development, and he called for further development of integrated decision platforms and climate outlooks to support climate services throughout the Caribbean.

Climate services around the World

Filipe Lucio
Global Framework for Climate Services

Filipe Lucio introduced the Global Framework for Climate Services (GFCS), which aims to enable adaptation and improved risk management through the use of science-based climate information. The GFCS focuses particularly on four priority areas (water, health, disaster risk reduction, and agriculture) and works to address these through five pillars of action (observations and monitoring, research modeling and prediction, climate services information systems, user interfaces, and capacity building).

The GFCS adheres to eight principles:

1. Priority shall go to building capacity in climate-vulnerable developing countries.
2. The GFCS should ensure greater availability of, access to, and use of climate services for all countries.
3. The GFCS will focus on three geographic domains; global, regional and national.
4. Operational climate services will be the core element of the Framework.
5. Climate information is primarily an international public good provided by governments, which will have a central role in its management through the Framework.
6. The Framework will promote free and open exchange of climate-relevant observational data while respecting national and international data policies.
7. The role of the Framework will be to facilitate and strengthen, not to duplicate.
8. The GFCS is built on user needs through user-provider partnerships that include all stakeholders.

The first meeting of the Intergovernmental Board on Climate Service (IBCS) was held earlier this year; it resulted in approval of an implementation plan and a plan to develop a compendium of GFCS projects. At present, there are more than 40 projects at the global, regional, and national scales; collectively, these are worth over CHF 140 million.

The GFCS has also hosted a series of regional workshops and national consultations. Regional workshops stressed the importance of research, the need to maximize resources by working at the regional level, and the role of the Regional Climate Outlook Forums. National-level consultations have led to systematic dialogue with users, an improved understanding of in-country capabilities, an identification of data and observation requirements, and a new understanding of priority research questions.

National-level climate services for agriculture

Alicia Martins
Ministry of Livestock, Agriculture and Fisheries, Uruguay

After introducing Uruguay's geography, climate, and agriculture-based economy, Alicia Martins discussed the Agricultural Information and Decision Support System being developed in Uruguay to provide critical and timely information on climatic events and their potential impacts. The system uses a climate risk management approach to improve and integrate existing climate and other datasets, establish and utilize an Early Warning System, monitor climate and vegetation in real-time, and develop simulation models to assess the impact of adopting different adaptation technologies. She also described several products being developed in Uruguay and the ways in which these products strengthen local capacity in participating institutions.

PARALLEL SESSIONS

Sectoral Studies

Are coastal zones well managed and resilient in the face of climate change?

Session leads: Kasey Jacobs, Caribbean Landscape Conservation Cooperative
Janice Cumberbatch, University of the West Indies

Impacts and costs of climate change in the Caribbean and role of ecosystem-based adaptation
Owen Day, CARIBSAVE Partnership

Owen Day began his presentation with a review of the impacts of climate change on coastal regions, which include effects on fish migratory patterns, cyclonic storms, increased runoff, acidification, sea-level rise, beach erosion, and coral bleaching. Many of these impacts are already making their mark on the Caribbean, and will have significant costs that require attention and planning that involves hard and soft engineering. Vulnerability can be assessed via the CARIBSAVE Climate Change Risk Atlas (CCRA), which also offers adaptation strategies.

Day continued by stressing that decision makers must manage for resilience, referencing the Caribbean Risk Sanctuaries Partnership Initiative and its work to protect reefs throughout the region, which are highly at risk. Training governments and facilitating community-based monitoring is critical, as is focusing on topics immediately relevant to community members. Discussing climate change, for example, will not result in action. Discussing fish in the context of climate change, however, is more likely to initiate local action.

Climate risk and adaptation services in coastal zones: the case study of the North Adriatic coast
Antonio Marcomini, Universita Ca'Foscari Venezia

Antonio Marcomini began by stressing the importance of employing user-friendly tools to facilitate the integration of climate information into coastal management. He described the Decision Support System for Coastal Climate Change Impact Assessments (DESYCO) as a useful mechanism to identify, prioritize, and visualize

coastal areas at risk from the impacts of climate change. DESYCO closes a gap between climate impact science and coastal zone policy in order to support decision making and climate proofing.

In all cases, there needs to be a link between climate and risk experts, which will enable the climate services community to develop hazard scenarios from climate data, and thus answer stakeholder questions and address needs. Early stakeholder involvement is critical so that projects can be more tailored to information needs.

Furthermore, Marcomini stressed the need to go beyond traditional impact studies and implement multi-risk assessments that consider the possibility of impacts from several climate-related hazards. This is especially true in the face of uncertainty – strategies to cope with multiple possible outcomes are critical.

A participatory process for the definition of climate products in coastal zones
Valentina Giannini, Centro Euro-Mediterraneo sui Cambiamenti Climatici

Valentina Giannini began with a discussion of the Climate Local Information in the Mediterranean region Responding to User Needs (CLIM RUN) project, which aims to develop a protocol for applying new methodologies and improved modeling and downscaling tools for the provision of adequate climate information at regional to local scales. CLIM RUN's work is meant to be relevant and usable for numerous sectors, though the project's three main areas of focus were tourism, energy, and wildfires.

Identifying end users via a participatory process is important in facilitating implementation. CLIM RUN therefore used a number of workshops and questionnaires to address needed timescales and resolutions and assess the ways in which research could best inform user needs. The next steps are to conduct research and provide products that effectively communicate results.

The role of climate in disease decision support systems

Session leads: Mary Hayden, National Center for Atmospheric Research
Rachel Lowe, Catalan Institute of Climate Sciences

An integrated approach to understanding dengue in emergent and endemic areas
Mary Hayden, National Center for Atmospheric Research

Annually, 300 million people contract dengue around the world. The virus is transmitted by mosquitos and can thus be affiliated with climate variability and urbanization. There are, for example, many temperature dependencies that cause an increase in the incidence of dengue. Warming temperatures are likely a factor in *Aedes aegypti*'s ability to survive at elevation.

As part of a project in Mexico, NCAR organized focus groups, distributed household surveys, and conducted additional outreach in order to determine the risk of dengue at the high altitude cities. The project also looks at energy balance modeling in breeding containers. Results indicate that we can expect a doubling of mosquitoes in next 20 years due to increase in temperature by 1 degree C. Meanwhile, rainfall does not have an effect.

Quantifying spatio-temporal risk factors of dengue to inform decision making
Rachel Lowe, Catalan Institute of Climate Sciences

Rachel Lowe presented work aimed at controlling the spread of dengue and impeding dengue epidemics. Climate forecasts provide an opportunity to incorporate precursory climate information in a dengue decision support system to aid epidemic planning through a Bayesian hierarchical mixed model framework for climate-sensitive diseases. Challenges lie in the lack of data to model the disease system, but a hierarchical model can be implemented. Using tools for visualizing probabilistic forecasts, one could map three probabilities and indicate certainties.

This technique was applied to model dengue fever during the 2008 epidemic in Brazil. The model was an improvement to current practice as it extended prediction lead-time to four months prior to the epidemic's beginning. Efforts are now being put toward the development of a climate-driven dengue early warning system for Ecuador, which takes into account climatic and non-climatic drivers of dengue epidemics in an attempt to identify the possible relevance of the El Niño index. Work is also being conducted to analyze spatio-temporal variations in dengue morbidity.

The importance of climate to the global distribution of dengue and yellow fever
Michael A. Johansson, US Centers for Disease Control

On the most basic level, dengue viruses are transmitted by mosquitoes to humans, though socioeconomic factors are also involved in the development of an epidemic, as are climate factors, including temperature, precipitation, and humidity, which play a role in transmission intensity and geographic distribution. Understanding the relationship between these factors involves writing case reports collecting environmental data, building statistical models, and creating risk maps that show the probability of suitability.

Dengue transmission occurs in both Puerto Rico and Madeira, but more in Madeira, where minimum temperature is a strong predictor for dengue suitability. The probability of yearly outbreaks is a function of suitability, as well as population, and

precipitation and a number of other parameters. Certain locations are endemic. Meanwhile, the yellow fever virus exhibits uncertainty, as climate and weather variables (e.e. temperature and humidity) play a role in influencing vector longevity.Studying climate data at different time scales can therefore help us to learn more about these linkages.

Leptosprosis as a global threat for both animals and humans: the GLEAN story
Claudia Muñoz-Zanzi, University of Minnesota

Leptospirosis is an environmental and occupational disease with a complex natural history. It is a pathogen with non-specific clinical presentation and a severe form. The Leptosprosis Burden Epidemiology Reference Group (LERG) has tried to estimate the magnitude of the disease: there are 56,000 deaths worldwide annually, and in some areas there are 975 cases per 100,000 people. Climate and weather influence disease outbreak, as risk factors include contaminated water and occupational exposure. Temperature/increased rain is associated with increased risk for leptospirosis.

The Global Leptospirosis Environmental Action Network (GLEAN) initiative has a mission to reduce impact of leptospirosis outbreaks through the provision of cost-effective, implementable, sustainable solutions. GLEAN works to understand how to reduce the impact of the outbreaks: predict, prevent detect, intervene.

Impact of climate change on health – Jamaica
Georgiana Gordon-Strachan, University of the West Indies, Mona

The biggest public health threat of the 21st century is climate change; it will hit small island development states first and Jamaica is particularly vulnerable. To illuminate these threats, Georgiana Gordon-Strachan explained that her work to determine the economic impact of climate change on dengue fever in Jamaica based on climate change projections for 2011-2050.

The project first developed a model to understand the relationship between climate and dengue in Jamaica. The model was validated by observations, and projections of the number of dengue cases per decade were made based on several climate change scenarios. This was extended to estimate associated number of deaths and total costs.

Gordon-Strachan also discussed limitations in the model, including the fact that the model is static, all variables not included, and environmental vulnerability was not included. The model also does not adjust for demographic vulnerability. However, the Climate Studies Group at University of the West Indies show a relationship between temperature, rainfall, and dengue epidemics. There is enough evidence for the incorporation of this information into an Early Warning System.

Climate services for better health: moving from risk assessment to risk management

Session leads: Michel Jancloes, Health and Climate Foundation
Madeleine Thomson, International Research Institute for Climate and Society

Climate services for better health
Chris Hewitt, UK Met Office

Chris Hewitt explained that the Met Office works across sectors through the GFCS, CSP, and various European projects on weather, climate and applied research and operational services/products. Hewitt discussed his involvement in collaborative research for weather and climate, including the development of early warning systems and public health alerts for a partnership with the Department of Health. He stated that there is great potential for climate services in the health field.

Improving climate services for the health sector
Tufa Dinku, International Research Institute for Climate and Society

There are many challenges associated with the availability and use of climate information. Tufa Dinku introduced the ENACTS program, which aims to improve the availability of data, improve data access and use, make information products and tools available online, and engage stakeholders. He discussed user engagement in Ethiopia and Tanzania, where climate impacts were incorporated into an assessment of malaria intervention. Dinku noted that major stakeholders/collaborators must be involved, and must get technical assistance, to enable success.

Climate services for better health
Carlos Corvalán, Pan American Health Organization

Carlos Corvalán explained his role as an advisor to ministries of three countries in Latin America and stated that although many diseases are climate sensitive, years after the first climate and health conference (1979), there has not been at lot of progress made in the field. His presentation was geared toward understanding recent efforts.

Corvalán continued with a description of the DPSEEA Model (Driving forces, Pressures, State, Exposure, Effect , and Action). In this scheme, later interventions aimed at reducing exposures or mitigating the health

impacts may appear to be more directly effective and sometimes less expensive, because they can be targeted more directly at specific population groups and health outcomes. Preventive measures, in contrast, tend to involve somewhat blunter tools, though they can control the problems at source, and often offer a wide range of other environmental and social benefits.

The Pan-American Health Organization (PAHO) and the World Health Organization (WHO) work to address the implications of climate change for health systems in four areas: finding evidence, raising awareness, building partnerships, and adaptation/strengthening systems. There are several challenges to this work: Although data is not costly, for example, interventions are. Also, building a model may be fairly straightforward, but it is not clear what to do with that information. Moving forward, we need to work toward developing a product that provides direct and applicable instruction for a minister of health in the face of drought or flood next year. Another challenge lies in the multidimensional nature of the health field: Climate variables are not the only factors that affect health systems. The uncertainty of climate information itself also serves as a barrier.

A climate and health partnership: the MERIT initiative
Madeleine Thomson, International Research Institute for Climate and Society

The Meningitis Environment Risk Information Technologies (MERIT) was launched in 2007 as multi-sectoral partnership led by WHO to enable health specialists with the goal of controlling epidemic meningitis in Africa. This health–climate alliance was established at a GEO-hosted Geneva meeting (2007). MERIT is a scientific platform; more specifically, it is an information/knowledge dissemination database and a platform for training.

The MERIT review in 2011 yielded several conclusions. Firstly, climate and other environmental factors contribute to spread of meningitis. Second, transitioning research into policy/practice strengthened by strategic approaches for the creation of evidence, together with development of cumulative knowledge base is critical. Third, effective means for disseminating new knowledge are also fundamental, as this creates a means to access this knowledge. Lastly, initiatives to increase the uptake of evidence in policy and practice must be developed. The group is considering the possibility of a MERIT 2. In 2012, the first meeting involving both operational and research communities took place. Moving forward, there is a need to focus on countries' capacity to absorb information.

Drought early warning information systems: reducing drought risks in a changing climate

Session leads: Robert Webb, US National Oceanic and Atmospheric Administration
Adrian Trotman and Cedric Van Meerbeeck, Caribbean Institute for Meteorology and Hydrology

Drought: science, monitoring, and early warning – the National Integrated Drought Information System
Robert Webb, US National Oceanic and Atmospheric Administration

Robert Webb began with a general discussion of drought, describing it as a "non-event that results in an event." The impacts are non-structural, and there are multiple indicators of drought.

Webb then moved into a description of the USUS National Integrated Drought Information System (NIDIS), which is meant to enable the US to move from a reactive approach to a proactive approach in addressing drought. NIDIS provides an early warning system, coordinates federal research in the physical and social sciences, and builds on existing forecasting activities. Ultimately the goal is to provide actionable information that answers questions such as “how did we get here?”, “is this drought like the past ones?”, “what are the impacts?”, “how bad might this drought be?”, and “when will the drought end?”.

Monitoring drought involves satellite observations, real-time precipitation measurements, improved estimates of evaporation losses, snow and streamflow data, and monitoring of ocean surface conditions. Understanding drought involves understanding a number of factors including sea surface temperature, climatology, land service conditions, and inter-annual variability. All of this makes it difficult to define drought, but a set of standard indicators can be used to support monitoring efforts.

Early warning information systems: an essential ingredient for drought management in the Caribbean
Adrian Trotman, Caribbean Institute for Meteorology and Hydrology

Adrian Trotman explained that despite common perception, the Caribbean has a well-established drought season, and the Caribbean Drought Predication and Monitoring Network (CDPMN) was developed to monitor precipitation using several indices. This kind of capacity is especially important in light of the drought of 2009-10, which was linked with an El Niño event and had major impacts on crops/livestock, food prices/inflation, the prevalence of bush fire, land degradation, water resources, and energy production. These impacts, resulted in a regional inter-governmental meeting, during which national leaders agreed that infrastructure was necessary to prepare for similar extreme events in the future. It was determined that national drought management frameworks were needed and should be established by national and regional research organizations. The challenge now lies in implementation.

Simple drought forecasts using standardized precipitation index (SPI) calculations for the Caribbean and Central America – a demo
Cedric Van Meerbeeck, Caribbean Institute for Meteorology and Hydrology

Cedric Van Meerbeeck began his talk with a description of the climate services value chain. He stressed that where links are missing in a chain, the solution is not to skip them, but rather to create them.

Van Meerbeeck went on to discuss drought early warning information systems (DEWIS), which have two components: monitoring and prediction. The best DEWISs must be reliable, timely, understandable, salient (directly important to the user), sharp (probabilities must be high enough that users choose to act), and economically sustainable. The regional climate outlook forums (RCOFs) are an effective mechanism to ensure that forecasters are in communication and in agreement.

Van Meerbeeck ended with a demonstration illustrating the use of a standardized precipitation index (SPI) to forecast drought. Input data are observed rainfall sums and model hindcasts, and the output yields the probability of different drought levels. The output can be produced very quickly, so the focus is on visualization and the "translation" of data into useful information. It is important to communicate with users on this, as different stakeholders will find different timescales and statistics more or less important. The RCOF is also a good venue for engagement on this level.

Van Meerbeeck concluded by saying that stakeholders should be involved in the design of the early warning systems. This way, if a forecast fails users will have a fuller understanding of why this happened and how forecasts can be useful moving forward.

Working Groups

Scaling up climate services for farmers: current challenges and best practices

Session lead: Jim Hansen, International Research Institute for Climate and Society

Introduction
James Hansen, International Research Institute for Climate and Society

James Hansen opened the session by introducing the session's five speakers; he also introduced the key questions for the session:

- What have we learned about how to bring climate services to smallholder farmers at scale?
- What do we still need to learn?
- How can we work together to make this happen?

Climate services for farmers: mission possible
Arame Tall, Climate Change Agriculture and Food Security of the CGIAR

Arame Tall began her presentation by discussing the various ways in which climate information can be useful to small farmers. Following a ready-set-go framework, information can be used in different ways:

- Information at long lead times can be used to select cultivars, choose seeds, or select alternative livelihoods.
- Information at somewhat shorter timescales can help farmers to anticipate wet and dry spells and manage risks in harvest operations.
- Information at short timescales can be used to help farmers select an appropriate harvest time, determine the timing of pesticide application, etc.

Tall also explained that farmers oftentimes do not get this information in time for decision making. This is due to a number of factors including: limited dialogue with end users to identify needs, inappropriate communication channels, poor observation networks, limited capacity of national meteorological and hydrological services, and limited capacity of end users to act.

Finally, Tall discussed three examples of CCAFS's efforts to overcome these challenges including: 1) an exploration of institutional arrangements that contribute to salience, 2) methods to encourage two-way communication between providers and users, and 3) the creation of a guidebook for intermediaries to communicate on climate services at scale.

Enhancing national climate services
Tufa Dinku, International Research Institute for Climate and Society

Tufa Dinku stressed that climate services are useful only in cases in which data is available to create such services. In many places throughout Africa, this is not the case due to sparse and declining station networks, uneven station distributions, and serious gaps in available observations. In some cases, data exists but is not made available by the meteorological services or other organizations that control them.

Dinku's approach to overcoming these challenges involves the Enhancing National Climate Services (ENACTS) framework, which aims to 1) improve data availability by combining station data with other proxies and 2) improve data access and use via the IRI Data Library. Dinku discussed the major outputs of this effort in Tanzania, Ethiopia, and Madagascar, where there are now 30 years of climate data for every 10km grid. This provides unprecedented online access to information products and is a big leap forward.

Developing and piloting sustainable approaches for scaling up climate services
Peter Doward, University of Reading

Peter Doward outlined the goals of his project, which are to provide farmers with useful climate and weather information in sustainable ways that facilitate farmers' planning and decision making. In this project, extension agents work with farmers to introduce climate information and its implications for livelihoods and planning. He detailed the ways by which extension agents engaged with farmers:

- Long before the season, they discuss climate data and planning.
- Just before the season, they discuss the specific forecast.
- During the season, they discuss the forecast and specific warnings.
- Shortly after the season, they review what was useful.

The project was found to be useful, and there is evidence that it has changed farmer behavior. It also has relative reach: Zimbabwe, for instance, 224 farmers have been intensively trained in this model, while ~6,000 others have benefited in some way. Doward concluded by offering that this method has the potential to be sustainable, but

there is a need for more training; he also stressed that this method focused on the process of decision making, rather than prescriptive decisions.

Including women in climate information services: prioritizing process over tools
Sandra Russo, University of Florida

Sandra Russo's talk engaged with a number of questions, including the importance of discussing gender with respect to climate services. Russo explained that women often access information differently than men; in this sense, it is important to consider methods of information delivery and information content to ensure that messages are understood and applicable. Translators are also important. Russo also stressed that tools must be the outcome of context-driven processes, including needs assessments and communication with different kinds of users. As part of her protocol, Russo specifically asks institutions, agents, and farmers how to improve the equitable delivery of climate services.

Participatory agro-climate forecasts
Diana Giraldo, International Center for Tropical Agriculture

Diana Giraldo discussed recent efforts to provide adaptation support for agriculture, specifically by improving the design and implementation of seasonal forecasts, policies, and adaptation interventions and by incorporating local knowledge into the analysis through Climate Field Schools. This effort was part of a South-South learning exchange between Colombia and Senegal, where strategic alliances have helped CCAFS partners to produce information that is understandable and actionable. In Senegal, the project began with local efforts and ultimately influenced the national policy; in Colombia, the project began with the national level and will hopefully influence the local level in turn.

Climate services and triggers: challenges and opportunities in scaling processes

Session lead: Dan Osgood, International Research Institute for Climate and Society

Dan Osgood led an interactive discussion with climate service providers and disaster-risk managers about available climate services and public goods that go into risk management decision making. Participants divided themselves into small groups to discuss questions relating to their activities in climate services. The discussion points focused on the limitations and opportunities for growth in access, accuracy, and scope of climate information available for index design. The session produced new conversation on ways to enable growth of climate-index based projects that utilize climate data. To design accurate indexes, reliable and accessible historic and current climate data is essential: the more robust the data, the greater potential for an effectual index. Access to these public goods is essential to expanding a climate-based index project to meet more peoples' needs, and transfer more peoples' risk. Additionally, strong climate service support can inform the index design process, resulting in a more effective project.

European Climate Services Network

Session lead: Chris Hewitt, UK Met Office
Guy Brassuer, German Climate Service Center

The concept of a European Climate Services Partnership (ECSP) was first proposed at the first International Conference on Climate Services in 2011; a meeting was held in Hamburg in May of 2012 and again at ICCS 2 in Brussels later that year. The group intends to ensure connectivity between climate service activities across Europe and provide a forum for discussion, sharing, learning, and the promotion of good practices within European institutions. Some possible functions of the group include: regional conference calls; a website; a newsletter; webinars; meetings. A number of issues were discussed during the meeting, including:

1. How to link to emerging adaptation services
2. Identifying sources or resources and financing
3. Mechanisms for the ESCP to disseminate and engage beyond the usual channels
4. How to ensuring activities are joined up in and beyond Europe
5. Creating examples of envisaged products, methodologies, standards
6. Identifying specific sectors and future initiatives
7. Identifying a structure and rules for membership for the ECSP

The following provisional working groups were identified:

1. Mapping existing climate services
2. Data and data quality, accessibility
3. Social science/societal transformation
4. Stakeholder engagement, communication
5. Modeling and infrastructure and capabilities

In the coming months, the ECSP will arrange themselves with respect to Horizon 2020 and Copernicus. There is also a meeting planned for February to bring people on board and allow for discussion regarding ECSP operations.

Prioritizing research in support of climate services

Session leads: Lisa Goddard, International Research Institute for Climate and Society
Lawrence Buja, US National Center for Atmospheric Research
Moderator: Jane Strachan, UK Met Office

Introduction
Lisa Goddard, International Research Institute for Climate and Society

Lisa Goddard opened the session by proposing several questions to guide the CSP's linkage with the research community:

1. What are the most pressing existing and emerging needs?
2. What understanding data and tools should be developed?
3. What mechanisms exist to bridge this working group to disciplinary research communities.
4. How do we move this process forward in terms of group structure and funding?

Goddard proposed WRCP organization as a reference: Regional Climate Information; Sea-Level Rise and Regional Impacts; Cryosphere in a Changing Climate; Changes in Water Availability; Clouds, Circulation and Climate Sensitivity; and Climate Extremes.

Prioritizing research in support of climate services
James Buizer, University of Arizona

In order to prioritize research for the development of climate services, James Buizer proposed the following questions:

1. Can decision makers access, utilize and optimize value from climate adaptation solutions that are emerging from research?
2. Are our research institutes equipped to create the knowledge and meet decision-making and policy formulation?
3. Are our funding institutes equipped to use climate knowledge emerging from research? How are these measured, tracked and assessed? Best mechanisms to make this happen?

USAID's climate change adaptation program
John Furlow, US Agency for International Development

John Furlow focused on USAID's priorities with regards to funding. USAID is not a research-funding organization, but will fund research when there is a direct connection with helping impoverished and disadvantaged communities. This is especially relevant with regards to adaptation and our understanding of the transition to climate resilient, low-emission sustainable development; to achieve this, we need to improve access to science and analysis tools.

Research priorities for climate services
Walter Baethgen, International Research Institute for Climate and Society

Walter Baethgen stressed that we should take advantage of existing institutions and individuals as we develop research priorities. This includes knowledge generation, translation, and application.

Baethgen also suggested that we need a "new kind of scientist" who can serve as a a translator and integrator of information, rather that as just a data provider. He stressed the importance of exploring research that promotes this "new" science and emphasized information chains and networks. When a chain is not working properly, it is important to strengthen it, and research should be conducted around the methods for doing do.

Baethgen also remarked on the need to restructure insulate these chains such that they do depend on single individuals and serendipity. That is, infrastructure needs to be reshaped to support information chains. However, institutional analyses is necessary in order to understand how best approach the restructuring process.

Baethgen finished by suggesting that we should continue to do research on decision support systems and their use as "discussion support systems." The work of translating climate information into useful tools and products is not complete, and there is a great deal of research around the interface between science and society that has yet to be done.

Climate services for development: (social) research priorities
Ed Carr, University of South Carolina

Ed Carr began his presentation by saying that climate services must combine local expectations and knowledge with external expertise to improve livelihoods and outcomes.

Carr also stressed that there are many different ways that members of a community may be vulnerable to climate variability and change and that there is a not a lot of information on this. To understand the use of climate information for improved outcomes in these areas, we will need to develop better livelihoods approaches and different ways to assess social vulnerability.

Research priorities in the Caribbean
Adrian Trotman, Caribbean Institute for Meteorology and Hydrology

Adrian Trotman explored the kind of climate-related research questions that will improve climate services in the Caribbean. Priorities included the physical processes that influence the climate in the Caribbean. This includes drought, but also the onset and cessation of the rainy season, and the timing of dry periods within the season. In terms of connecting climate information with society, Trotman stressed the need for decision calendars, including crop and water calendars that would assist in determine appropriate lead times. He also stressed that there is a need for a clear understanding of the relationships between phenology and climate cultivars grown in a region.

Climate services and the private sector

Climate services and the private sector
Guy Brasseur, Climate Service Center Germany

Guy Brasseur first addressed the needs of the private sector, where climate change is just one of many risks. Brasseur also highlighted private sector needs for information at different timescales; while climate change will play out over many years, businesses are primarily looking for information on the 5-10 year time frame. Most importantly, Brasseur discussed difficulties in finding an appropriate business model to work with the private sector, as corporations do not work the same way as research organizations.

The CCCA, its climate services, and approaches to reach the users
Matthias Themessl, Climate Change Center Austria

Matthias Themessl's talk focused on the Climate Change Center of Austria, which was created in 2011, and a recent process of stakeholder analysis. Process results indicate that that average users are more interested in general guidance than data.

Themessl also highlighted three of CCCA's projects. One of these is the Austrian Panel on Climate Change (APCC). Funded by an Austrian agency and modeled off the IPCC, the APCC not only created climate change projections for Austria, but also focused on dissemination and roundtable presentations of information for average users. Themessl also talked about a project, entitled the Cost of Inaction (COIN), which tried to estimate the costs of not mitigating climate change.

Finally, the presentation highlighted a book that discusses the climate change impacts on viniculture; Themessl mentioned that when the book launched, wine growers and a sommelier came together to help bridge the scientific information with potential users.

The international energy and meteorology community
Alberto Troccoli, Commonwealth Scientific and Industrial Research Organization

Alberto Troccoli began his presentation by discussing global historical and projected energy demand and stressed the many ways in which meteorological variables are relevant to energy production and sale. He also discussed the International Conference on Energy and Meteorology, the first of which was held in 2011 in Australia, and the second in 2013 in France. ICEM focuses on the identification of key meteorological issues to better support the energy industry. It also strengthens links between the energy industry and the weather and climate communities.

Climate services evaluation

Session lead: Cathy Vaughan, International Research Institute for Climate and Society

Adaptation made to measure: GIZ's experience with monitoring and evaluating of climate change adaptation
Eva Wuttge, Deutsche Gesellschaft fur Internationale Zusammenarbeit

Eva Wuttge began her presentation by articulating the rationale for monitoring and evaluating climate change adaptation activities. The motivation here includes 1) identifying what works well; 2) creating a mechanism for accountability; and 3) compiling with international reporting standards.

There are, however, a number of challenges associated with adaptation monitoring and evaluation (M&E). These include: uncertainty, complexity, and the long time horizon. In this context, adaptation M&E suffers from the fact that there is not one universal indicator. Since adaptation does not lend itself to a "one-size fits all" approach, our goal should be to design an M&E frameworks to manage each individual project. These frameworks should be guided by certain principles including, though not limited to, a need to design for learning, manage for results, and maintain flexibility.

In the report 2013 *Made to Measure*, GIZ released a five-step approach to monitoring adaptation, which includes describing the adaptation context, identifying the contribution to adaptation, defining a results framework, establishing indicators and setting a baseline, and, finally, operationalizing the M&E system. The lessons of adaptation M&E are relevant and contextualize those challenges faced by people who are attempting to evaluate climate services more specifically.

Evaluating climate services: lessons from Mali
Ed Carr, University of South Carolina

Ed Carr introduced Mali's Agro-meteorological Program, a program designed to help Malian farmers deal with climate variability. In its pilot phase, the project consisted of 4 villages and 15 farmers. The project was funded the by the Swiss Cooperation for 25 years before the Mali government took it over in 2007. During that time, rain gauges were distributed to farmers, and an advisory board was put in place to make rainfall data-based recommendations on crop planting times.

Throughout the duration of the program, the yield increase for the five key crops – soy, millet, peanuts, maize and sorghum – was in the 20% range. The program was successful and endured where others failed across the Sahel. Assessment outcomes yielded very "noisy" data, though there is evidence of a very strong correlation between crop selection and access to the program. However, Carr notes that this evidence was uneven: there were only a few crops, and different crops depending on the location. There was also evidence of strong correlations between variety selection and program access. This too was uneven, however, as there is usually only one crop per location. Ultimately, it is difficult to explain these correlations, and future attempts to do so should involves qualitative analysis.

Carr continued on to discuss lessons learned from the program experience. Firstly, post-hoc evaluation is time-consuming and expensive. Outcomes are often noisy, and rigorous explanation requires intensive time and financial investment. To overcome these challenges, evaluation must be built into the project design. Furthermore, evaluators and program leaders must be prepared to act on any "surprise" outcomes of assessment.

Caribbean agrometeorological initiative: Raising farm productivity
David Letson, University of Miami

David Letson reported that the Caribbean Agrometeorological Initiative (CAMI), which was funded by the European Union (EU) and ended about a year ago. The CAMI documentation process continues in an ongoing effort to achieve the initiative's long-term objectives of increasing agricultural productivity. CAMI works with CIMH and agriculture ministries in most of the English-speaking Caribbean through activities such as data rescue, rainy-season modeling, and communication workshops.

Challenges in the evaluation chain lie in the fact that we still do not know if the meteorological and agricultural industries are providing the kind of information that farmers need. Other unanswered questions include how outcomes are achieved, if Caribbean agricultural ministries are communicating with farmers and meteorological services, how the experience is different country to country, and if efforts are sustainable. According to Letson, there is evidence of capacity building through trainings, agency collaborations, and farmer appreciation. Similarly, the basic framework for mid-level evaluation is culturally aware regarding risk attitudes and variance. Further information is needed regarding long-term agricultural evaluation.

Evaluating climate services for smallholder farmers: lessons from Kaffrine
Arame Tall, Climate Change Agriculture and Food Security of the CGIAR

Arame Tall began with a discussion around the challenges associated with evaluating climate services for farmers in Kaffrine, Senegal. These challenges were identified during an expert roundtable held in June of 2013. Economists, anthropologists, and scientists came together to identify what, if any, value could be added by climate services to the agricultural sector of the region. They concluded that this was hard to determine because a method for evaluating the impacts of climate services has yet to be established

To explore the ways in which climate services are useful to the farming community, a three-phase, five-step framework was suggested. This process involves developing and testing tools in context to determine the ways in which farmers make decisions using climate information, measuring the impact of GIS in the community, and defining the parameters of data collection.

The goals, Tall said, are to develop a M&E protocol to identify farmers' needs for climate services and to measure added value for agricultural communities using guidance on baseline collection, monitoring, re-assessment, and final project impact assessments that are locally relevant and gender responsive.

Assessing the socioeconomic benefits of meteorological and hydrological services
Glen Anderson, Engility

Glen Anderson explained that thinking about value chains is a useful way to assess benefits. Decision making is difficult and depends on production, market, risk, and entrepreneurial capability. The benefits are avoided costs and damages, and the motivation is national meteorological and hydrological services. There is a need to determine and quantify the benefits of such services to society. *Ex ante* and *ex post* studies can be done to achieve this.

At the first ICCS, a working group was formed to review more than 180 articles that did evaluations in climate services. The group found that less than 50 of these produced numbers.

Research is limited in developing countries where agriculture is very important. Anderson stressed the importance of designing projects that make climate services practical; understanding and communicating the socio-economic benefits of climate services is critical when interacting with an audience of policy-makers, researchers, practitioners, meteorologists, and hydrologists.

Project Reports

Linking Climate Services to Resilience Building: the PPCR Experience

Session leads: Kanta Kumari Rigaud, World Bank
Evan Thompson, Jamaican Meteorological Service

Introduction
Evan Thompson, Jamaican Meteorological Service

Evan Thompson explained that the session would focus on the World Bank's Pilot Programme on Climate Resilience (PPCR), and introduced practitioners from Mozambique, Nepal, Niger, Tajikistan, and Yemen, who later shared challenges, early lessons learned, and immediate needs from their projects. Mr. Thompson then introduced Kanta Kumari Rigaud, from the World Bank, who provided an overview of the project itself.

Pilot Program for Climate Resilience: Grounded in climate services
Kanta Kumari Rigaud, World Bank

Kanta Kumari Rigaud introduced the PPCR program, key investments, and goals. She explained that there are two Climate Investment Funds: the Clean Technology Fund (USD 4.8b) and the Strategic Climate Fund (USD 2.2b). The latter supports PPCR with USD 1.2b. PPCR has been underway for almost three years and has begun work on key investments under strategic plans.

The PPCR program has a diverse portfolio and supports a wide range of activities, including early warning systems, improved equipment, better observations, improved forecasting, improved climate change modeling, research, and capacity, building. PPCR investments related to weather/climate services are currently USD 120m, leveraging an additional USD 150m.

Particularly unique are the challenges and solutions proposed by PPCR programs; of the five PPCR climate services projects (USD 85m) under implementation, two out of five of the core indicators are in climate services. As such, there is a demand from PPCR task teams for guidance on how to integrate climate services into project design and how to best use the value chain of data, information, and products/services. This involves integrating climate services into the value chain of project investments throughout the project cycle.

PPCR pilot country: Mozambique
Jose Alvaro Malanco, Water Resources Manager, National Directorate for Water, Mozambique
Anacleto Duvane, Meteorologist, National Institute of Meteorology, Mozambique

Jose Alvaro Malanco and Anacleto Duvane explained that the PPCR project in Mozambique aims to enable hydrometeorological services to deliver reliable and timely climate information to local communities and thus further economic development. There are several aspects of the Mozambique context that are important to consider. Firstly, nine out of thirteen major rivers are shared with neighboring countries, and an understanding of river flows is therefore critical. Second, the mandate to monitor and forecast hydrological and meteorological phenomena in Mozambique is split between two ministries. Although this is not uncommon, the situation does call for additional efforts to ensure and maintain consistency and to facilitate the sharing of data. Third, the project has several implementing agencies and involves complex procurements – as such, strong financial management will be important.

The project seeks to: improve forecasts and the downscaling of existing information; create early warning systems; increase user satisfaction; improve the operation and reporting of river gauge and weather stations; transfer climate data into the WMO international system; and facilitate necessary training.

PPCR pilot country: Nepal
Rishi Ram Sharma, Director General, Department of Hydrology and Meteorology, Nepal

The PPCR project in Nepal builds resilience to climate-related hazards. According to some measures, Nepal is the fourth-most most vulnerable country to climate change in the world – this is compounded by the fact that hydro-meteorological networks are weak and forecasting is subjective in this agrarian country.

Rishi Ram Sharma explained that the project is focused on increasing the accuracy/ timeliness of weather forecasting, increasing the satisfaction of users, creating an introductory agricultural management information system, and increasing financial sustainability. To do this, the project is engaged in institutional strengthening, capacity building and fostering sustainability at the Department of Hydrology and Meteorology (DHM), the modernization of the observation networks and forecasting, and the enhancement of the service delivery system of DHM, focusing particularly on climate and weather information for users in agriculture.

PPCR pilot country: Niger
Yahaya Nazoumou, Climate Change Expert, Strategic Program for Climate Resilience Coordination Unit, Niger

Yahaya Nazoumou described Niger's Climate Information Development and Forecasting Project (PDIPC). Niger shows a high potential for improved food production, especially in rain-fed agricultural systems, where there is high inter-annual and intra-seasonal climate variability and poor management of climate resilience. PDIPC covers the country's eight administrative regions.

End-users are aware of and interested in climate information and services, and they are particularly concerned with forecasts regarding the characteristics of the next rainy season. End-users also need timely access to relevant climate information for planning agricultural activities. These users should be capable of understanding climate and weather information, but capacity needs to be built via appropriate tools and methods.

Practical solutions include: strengthening the national climate observation network, developing/improving climate products adapted to producers' needs, establishing a climate information dissemination mechanism, generating climate scenarios for Niger, assessing the vulnerability to climate change, establishing a multi-hazard early warning system for climate, and creating an information dissemination network covering all district councils.

PPCR pilot country: Tajikistan
Anvar Homidov, Leading Specialist, State Organization on Hydrometeorology, Tajikistan

Anvar Homidov described the PPCR work being conducted in Tajikistan, which aims to reduce the risks associated with adverse weather and climate events by strengthening meteorological, hydrological, and climate services, ultimately improved human welfare and bolstering economic development nation-wide.

Key challenges associated with this project include a lack of: trained specialists, scientific basis, funds to bolster the observational network, and experience in marketing.

Lessons learned through project thus far include: 1) national institutions have limited capacity; 2) it is difficult to coordinate multiple stakeholders; 3) establishing multiple legal agreements is challenging across countries; 4) skills in procurement and financial management have been gained; and 5) project design

should align with beneficiaries' ability to absorb proposed changes.

Practical solutions being pursued by the project include 1) the development of a marketing program to provide fee-based services; 2)the compliance of scientific methods with WMO manuals/guidelines; 3) support training; and 4) support for individuals to participate in travel and training activities at leading institutions.

PPCR pilot country: Yemen
Nabil Abdulqader Sha'lan, General Director, National Water Resources Authority, Yemen

Nabil Abdulqader Sha'lan described that the Database Center is at the core of the Yemen PPCR project: meteorological data is collected from monitoring stations, sent to the national climate database/early warning systems, and used for forecasting and raising public awareness via the government distribution network.

The project also facilitated the creation of a map of institutions with climate information: This involved a questionnaire survey, a user-needs assessment, and an institutional assessment. In addition, the Government of Yemen established an Inter-Ministerial Committee for Climate Change (2009) and the ministries signed an MOU for data sharing/services (2013).

Key challenges of this project include the fact that Yemen is exposed to a number of risks associated with climate variability and change including, irregular rainfall, increased rates of evaporation/transpiration, and drought/flash floods. Furthermore, cooperation for data services currently exists within certain ministries, but there is external coordination between authorities due to a lack of binding agreements. As a result of these challenges, Yemen is lacking early warning systems, unified information centers, data collection stations, and maintenance for existing stations. More specifically, there is also a need for a better a rainfall monitoring network.

Some of the immediate practical solutions being pursued by the project include 1) improving the quality of meteorological, hydrological, and climate services provided to end-users; 2) strengthening institutions responsible for monitoring; 3) strengthening partnerships between main authorities; and 4) introducing modern technologies.

Joint Programming Initiative Climate

Session leads: Dagmar Bley, Project Management Agency at German Aerospace Center
Maria Manez Costa, Climate Service Centre

JPI Climate: Mission, purpose and current development
Dagmar Bley, Project Management Agency, German Aerospace Center

Dagmar Bley explained that research programs in Europe often are run in isolation, leading to fragmentation, duplication, and ineffectiveness. Joint programming is a solution to this challenge; it was introduced to increase the impact of national European Union (EU) research and development funding through joint planning/ implementation, evaluation of national research programs, establishment of a platform align research funding priorities, and common financing.

Climate research in Europe is marked by multiple players, many national research contributions, and a generally weak link between scientists and decision-makers. JPI Climate is an initiative to coordinate European research on climate change and provide

knowledge for decision support. The governance board has representatives from 13 member countries, and consists of several working groups and is led by a management community, central secretariat, and advisory board.

The project proposal was first accepted in 2010, the first board meeting was in 2011, and the project was ultimately launched in Brussels in 2012. The project is being implemented through the following mechanisms:alignment of national research programs, joint research funding, conferences, workshops, courses, policy support, and collaboration. Working Group 2 has a climate services focus, and works to map user requirements, climate services providers in Europe, national dialogues, etc. All of these activities are voluntary and all engage an integrated climate knowledge approach.

Providers of climate services in Germany
Maria Mañez Costa, Climate Service Center

Maria Mañez Costa described efforts to map climate services in Germany. First, the group distributed surveys to the climate knowledge pool for mapping of climate services providers (private, government, research institutions). This included a questionnaire that engaged the following issues: who is offering the climate service, what kind of service is being provided, is the service free, and who are the service users? Results were obtained throughout the country: The main service providers are private companies, and the main users are from the private and research sectors.

There is a strong network for communication throughout Germany. The information from the survey showed that services offered include data, customized data, consultancy, capacity building, and synthesized knowledge for the private and public sectors. Methodologies include data collection, analysis, modeling, capacity building, management, and support.

Overall, most providers were working at the regional level, using data from the present until 2040. Thirty percent of respondents were unable to comment on the data source. Many respondents were unable to specify the type of data they use. A few indicated that they collect their own data. Many do not have any means of evaluating their activities; rather, this is done mainly through feedback surveys/audits. At present, the response rate is 70 out of 250, and the survey is still lacking response from some major research centers.

Climate service providers and users requirements
Matthias Themessl, Climate Change Centre Austria

Matthias Themessl discussed a national survey conducted in Austria with 125 participants for identification of climate service users and providers. The survey found that providers mainly included university/research facilities and meteorological services. Following completion of the survey, the Climate Change Centre Austria (CCCA) organized a workshop to promote national dialogue on climate services. Workshop participants included both providers and end-users, and the event and focused on how

co-production can be fostered. The workshop structure consisted of two days of open-space discussion methodologies to enable a dialogue platform.

The workshop highlighted certain perspectives; providers wanted to know how climate services can be communicated, evaluated, visualized, and users had opportunities to present their most pressing questions. A chief lesson learned from the survey and workshop is that Austrian climate services are mainly provided by universities and the meteorological service and are data (not demand) driven. There is a diverse landscape of climate services in Austria, no quality standards, and many do not know how to assess the quality of the provided climate information. As such, overarching guidance and summaries of climate-relevant information is as important as specific data needs; climate services providers should catalog reliable parameters, provide a glossary to facilitate better communication, and ensure that social scientists are engaged in climate services production.

How can we create synergies and links between JPI-Climate and other initiatives?
Chris Hewitt, UK Met Office

Chris Hewitt discussed international climate services activities on the global scale (GFCS, CSP), the European scale (FP7 projects, etc.), and the national scale (many). He then discussed how JPI-Climate fits into the GFCS and the ways in which it links to both the CSP and the European Commission-funded R&D projects related to climate services.

Hewitt then moved on to discussed Copernicus, a satellite observation and monitoring program that is moving into the realm of forecast services. How can we create synergies/links? Opportunities exist because people and institutes overlap, create projects to enable the identification and exploitation of synergies and links, create new representation on the other activities, and participate in other activities.

Climate services for the agricultural sector in Jamaica

Session lead: Jeffery Spooner, Meteorological Service of Jamaica

Jamaica's institutional arrangements – a response to climate change
Albert Daley, Ministry of Water, Land, Environment and Climate Change

Climate change presents Jamaica with an unprecedented and multi-dimensional development challenge. Albert Daley described recognized urgent needs including comprehensive institutional response, the need for greater coordination across key

players, and an integration of climate change into national plans. Key initial actions of the government include the creation of the Ministry of Water, Land, Environment, and Climate Change in 2012, the establishment of a Climate Change Advisory Committee, involvement in Vision 2030, the development of a climate change policy framework and action plan, and the establishment of a Climate Change Division.

The Jamaican government has employed various strategies to improve climate change adaptation, including mainstreaming climate change adaptation into planning and decision making, establishing a network of climate change focal points in government, promoting the implementation of specific adaptation measures, promoting actions to reduce GHG emissions, setting standards for reporting, and monitoring and evaluation. The Jamaican government has also collaborated with a Climate Change Advisory Committee and various academic institutions to pursue a research agenda and promote public awareness of climate change.

Developing climate services – the process
Jacqueline Spence, Applied Meteorologist, Meteorological Service, Jamaica

Jacqueline Spence described the process of developing climate services for the agricultural sector in Jamaica, which has involved a number of stakeholder meetings and consultations. In May 2013, the Met Service met with key stakeholders to raise awareness of climate services and identify stakeholder needs. Meeting attendees also discussed the fact that there are insufficient climate data collection stations.

After this meeting, focus groups were formed, working with the agricultural sector and the Caribbean Agrometeorological Initiative (CAMI) project, which includes various activities and trainings. Partners also joined a working group, including representatives from the Met Service, the Rural Agricultural Development Agency, Jamaica (RADA), the Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance (ACDI/VOCA), and others. To date, the working group has focused on the development of a drought prediction tool, the training and capacity building of extension staff, and further development of a CAMI bulletin. Next steps for the activity will include a soil-moisture balance tool and a pest and disease model.

Climate information and outreach in the Jamaican agriculture sector
Cavell Rhiney, Rural Agricultural Development Authority

Jamaica's agricultural sector is climate sensitive. Nevertheless, prior to CAMI, there was not a specific climate information tool available for the agricultural sector. The CAMI project resulted in a bulletin (produced by Jamaican meteorological service) and the National Agricultural Disaster Risk Management Plan (2009).

Climate information needs for agriculture include regular weather bulletins, early warning systems, and predictability. Challenges to using climate information in agriculture include limited access to information and the fact that information is not always easily understood. For instance, RADA officers are trained to collect data, but interpretation capacity is limited. In addition, climate information doesn't always reach farmers, and there is limited capacity to generate tailored climate products. Communicating information is also difficult, extension services are also often unable to integrate climate information, and technical understanding among farmers is limited.

The working group has made progress, and next steps include completing work on soil water balance for Irish potato crops, working to influence decision making at different

levels in a targeted way utilizing existing products, and developing climate change strategies for the agricultural sector.

Jamaica Climate Service Working Group
Glenroy Brown, Meteorological Service of Jamaica

All climate activities in Jamaica are primarily based on weather observations. There are weather stations across Jamaica, and the government is working to introduce automatic weather stations. However, this is not yet sufficient, and further development is needed. Currently, historical data consists of an archive of monthly data going back to 1902, with daily records from 1992 forward (daily data preceding 1992 was unfortunately lost). Jamaica is currently developing a climate database. The Jamaican Meteorological Service's current practices and products include a seasonal three-month rainfall outlook, which is made using the Climate Predictability Tool (CPT) from the International Research Institute for Climate and Society (IRI). The Jamaican Meteorological Service also verifies the forecasts using relative operating characteristic (ROC) diagrams, monthly rainfall summaries, drought maps, monthly farmers bulletins, monthly drought observation, and a 24-hour real-time weather forecast.

The Meteorological Service is also working on several desired products, including a drought atlas showing rainfall return periods, seasonal temperature forecasts, and a pest and disease forecast for the Beet Armyworm. These products can be accessed through mailing lists and web portals (metservice.gov.jm, agrilinksja.com, jamaicaclimate.net). The Met Service is also working on forecast-related products including an SPI drought forecast and a real time weather forecast.

Capacity building support by JaREEACH
Dianne Dormer, Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance

The Jamaica Rural Economy and Ecosystem Adapting to Climate Change (Ja REEACH) Project involves several components: lives/livelihoods, institutional strengthening capacity building and coordination, and project-targeted ecosystems. As part of the second component, capacity building, national-level priority actions are in place, focusing on the Ministry of Agriculture and Fisheries. There are also community-level priorities set to coordinate with the Meteorological Service of Jamaica and RADA for training for farmer field schools. To date, there has been some trouble-shooting of weather stations, WMO procedures (maintain integrity of data), and climate data analysis/interpretation/packaging. Training programs have also been developed to introduce extension agents to existing products.

Looking ahead, Dormer explained that the project will focus on developing a framework for coordination/integration involving various disciplines (science, policy makers, recipients). There are some information challenges, however, including a lack of data, inadequate research, and inadequate coverage of automated weather stations. The solutions to these challenges involve linking the information and its users. In the future, the project will clarify/strengthen institutional arrangements, engage effectively with recipients, and utilize emerging information to improve policy integration across priority sectors.

Findings plans: products and activities, new capacities, and international partnerships
Clifford Mahlung, Meteorological Service, Jamaica

Mr. Mahlung offered a long list of possible clients for climate services in the face of an anticipated increase in extreme events, including the Ministry of Agriculture and Fisheries, the Ministry of Foreign Affairs and Foreign Trade, farmers, hotels, and the Planning Institute of Jamaica. He stressed that new products are very important because of the diverse pool of stakeholders.

Integrated climate risk management at the UNDP

Session leads: Rajeev Issar, United Nations Development Programme (UNDP)

Integrated climate risk management – Reducing risks-securing development
Rajeev Issar, United Nations Development Programme

UNDP has formulated a climate risk management approach involving a five-step process and analysis on three timescales: past, current, and future. The process involves identifying risks and impacts and assessing institutional, policy, capacity deficiencies. It also involves generating evidence-based convergence on climate risk management and providing decision analysis support to policy and decision-makers.

The steps of the integrated climate risk management framework include building an evidence base for climate risk management (CRM), conducting climate risk assessments, mainstreaming CRM into development planning, facilitating disaster risk reduction and climate change adaptation development convergence frameworks,building risk reduction and adaptive capacity, and implementing CRM measures to reduce risks. Integrated climate risk management enables development, addresses climate risks/ impacts, and adds coherence/coordination across all scales, sectors, development concerns, stakeholder groups. UNDP's Global disaster risk reduction and climate risk management portfolio focuses on increasing disaster risk reduction and climate change adaptation convergence in UNDP programming, databases, and lead agency for Global Environmental Facility.

Key needs include integrating risk over short and long-term time horizons, analytically assessing climate risk, developing disaggregated assessment/analysis, expanding the timeframe of climate assessments to account for risk accumulation, and establishing linkages between regional/global institutions for climate monitoring/analysis. Because risks are interconnected, vertical and horizontal integration are also important.

Stakeholder engagement and community perspectives
Anne Hammill, International Institute for Sustainable Development

The International Institute for Sustainable Development (IISD) conducted climate risk assessments for UNDP. This has involved delivering climate information to communities and engaging with different stakeholders central to understanding and prioritizing climate risk while focusing on the use of community-level knowledge to complement climate science and devise risk management options. The purpose of the project was to identify priority climate-related risks/management options and to inform relevant national programming/policy decisions.

This participatory process, called the Climate Risk Management Technical Assistance Project, involved identifying mechanisms to make new advanced as relevant and useful as possible, while building on existing structures. . The process of engagement involved governments via UNDP, researchers via IISD networks, communities via development partners, and in-person, formal/informal networks. The process is also iterative, framing and re-framing the issues, and involved community participation: identifying how climate affects livelihoods, prioritizing impacts, and using CARE's Community-Based Risk Screening Tool (CRiSTAL) tool.

In the Dominican Republic, work is being done in a watershed prioritized by government with high levels of of poverty and vulnerability to the impacts of extreme events.. This process has involved local consultations and the use of various tools, including Water Evaluation and Planning System (WEAP), the Decision Support System for Agrotechnology Transfer (DSSAT), and the Prevention of Significant Deterioration (PSD) Workshop. This project looked at watershed/entire basin, institutional/policy recommendations.

Hammill also presented lessons learned during this project, including the fact that bringing stakeholders together can be complicated; the process takes time and resources.

Strengthening climate services to manage risk and impacts from climate variability and change
Dr. A.R. Subbiah, Regional Integrated Multi-Hazard Early Warning System for Africa and Asia

Subbiah introduced the concept of climate services, and their importance for managing risk associated with climate variability and change. He also presented a UNDP program on managing climate-related risks, and talked through the requirements for effective management, including 1) climate information; 2) an effective delivery mechanism; 3) capacity for use; and 4) iterative analysis of risks and options for risk management and adaptation.

Subbiah also presented issues and gaps regarding these four items: climate information is not always what is anticipated, effective delivery mechanisms are difficult to design and maintain, users' are sometimes challenged by managing uncertainty, and iterative processes are difficult to develop. To meet these challenges, Subbiah suggested that we focus on 1) improving data availability; 2) capacity building in climate information; 3) establishing a mechanism for delivery; and 4) mobilizing resources.

German-Grenadian Pilot Program on Integrated Climate Change Adaptation Strategies
Dieter Rothenberger, Deutsche Gesellschaft fur Internationale Zusammenarbeit / Grenada

The Pilot Programme on Integrated Climate Change Adaptation Strategies runs from January 2013 to October 2016. It is funded at 5 million Euros by the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety under the International Climate Initiative (ICI). It is implemented by GIZ and UNDP, together with the Grenadian Ministry of Agriculture, Forestry, Fisheries, and the Environment.

Development challenges for Grenada are exacerbated by vulnerability to climate change. These challenges are focused on sectors including water, infrastructure, industry, agriculture, human settlements, health, coastal zones, forests, and disaster risk reduction. Grenada is very vulnerable to climate change, and thus requires a comprehensive/strategic approach focused on more than one sector and region.

The project's strategy involves an integrated approach to climate change adaptation, including multi-level/sectoral methods of working with many actors, implementing and testing concrete measures, cooperating with other regional activities, and conducting international outreach.

The project outputs include increasing resilience to climate change risks through integrated adaptation strategies:

- Output 1: Strengthen capacity of the Government of Grenada to mainstream adaptation considerations and improve coordination.
- Output 2: Provide concrete adaptation support for water/coastal sector.
- Output 3: Implement concrete adaptation measures at local level.
- Output 4.1: Build capacity to access climate finance.
- Output 4.2: Manage knowledge regarding the overall programme.

Informing DfID's research funding for early warning systems and risk assessment of weather-related hazards

Session leads: Darren Lumbroso, HR Wallingford
Alex Harvey, UK Department for International Development

This workshop aimed to:

1. Seek a broad range of views on the knowledge gaps and research priorities to enhance the use of disaster risk assessment and early warning systems in the Caribbean
2. Gain feedback on initial plans for a new research program, "Science for Humanitarian Emergencies and Resilience" (SHEAR), to be funded by the UK Department for International Development (DfID)

Breakout groups were asked to discuss climate-related hazards and answer the following questions:

1. What are the current initiatives for risk assessment and early warnings systems?
2. What are the gaps where new research is needed?
3. What the research initiatives that best meet end-user needs?

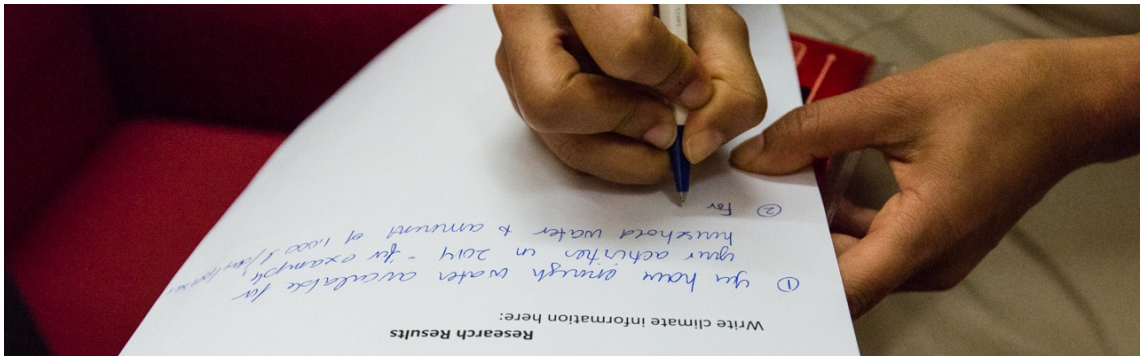
Discussion focused around three topics: research, capacity building, and establishing good practice.

Research priorities and gaps have thus far been identified in the areas of 1) drought and flood forecasting (and other hazards, other than hurricanes); 2) open data and modelling platforms. Current initiatives for risk assessment and early warning systems in the Caribbean include HED (CIMH, IRI, CERMES/UWI), CARIWIN (5Cs), IRAP, National Drought Management (the Brazilian funding and collaboration tool), and storm surge monitoring work (Barbados). However, there are very few integrated databases for sectoral impacts, and there is a lot of interest in loss and damage research, which would also require a development of metrics. Data collection stations also need to be set up in the eastern Caribbean, and existing buoys need to be better maintained – hurricane systems have been building more quickly, and the lack of ocean information inhibits monitoring and forecasting capabilities.

In a discussion around capacity building, it was concluded that among South Asia, Africa, and the Caribbean, the greatest prevalence of early warning systems exists in the Caribbean and the least in South Asia. The same is true for the prevalence of early risk and vulnerability maps. Generally speaking, information formatting must be suited to user context, even if the information being distributed is the same. Similarly, research is needed regarding the communication of warnings, and the mechanisms that most effectively get people to respond.

The workshop also asked the question, what are the social restraints of communicating warnings? Throughout the Caribbean, for example, there is access to certain television stations, and many people have smartphones. However, computers access is quite limited. Early warning websites should therefore be translated into phone apps. Meanwhile, different countries throughout the Caribbean operate under different institutional structures. We might think about researching the flow of information, and the time it takes for that information to get from one level of the value chain to the next. Lastly, tourism is the main industry of the region. It is not always engaged with government in terms of climate projection, though it should be.

Finally, in the discussion around establishing good practice, it was noted that throughout the Caribbean, building code is currently adapted to the climatology, but not to climate change/variability. What are the mitigating management strategies could be put in place before an extreme event? Modelling different scenarios and places where these strategies would be most relevant may be a good step toward establishing good practice. Evaluating existing early warning systems may also be a valuable avenue. There is a fine line between evaluation and research, and this should be thought through carefully. Investigating the valuation of climate service may be a good route.



Participatory development of seasonal forecast action alert for the Caribbean

Session leads: Ashley Curtis, International Research Institute for Climate and Society
Erin Coughlan, Red Cross/Red Crescent Climate Centre

The Caribbean Action Alert is a tool designed by Red Cross/Red Climate Centre and IRI associates to help disaster risk managers identify specific actions that will be most useful for a range of flood risk levels (low, medium and high). The cost of actions may vary across levels.

One challenge to implementing the tool is that information regarding a forecasted flood probability does not solely determine the appropriate actions. That is, flood risk levels are not dependent solely on rainfall indexes.

Participants in the session, particularly those from the Jamaican Ministry of Water, Land, Environment and Climate Change, CIMH, and IRI agreed that flood risk is site-specific. Land use management and other existing conditions of the landscape such as natural drainage, inhibitors, triggers, and infrastructure should all be taken into account to help identify thresholds of flood risk levels. Participants also stressed that users and scientists should continue to work together in this effort to keep disaster risk managers informed.

TOOLS EXPO

ICCS 3 featured the first ever Tools Expo, which provided conference participants with an opportunity to learn about a range of tools that can assist in the prioritization, production, and use of climate services. The event also allowed those who have developed or are familiar with specific tools to share their expertise with the wider community. In total, the event featured 28 tools; more information and a list of the tools provided can be found in Appendix 4.

The Expo began with a series of short presentations by tool experts. The poster session that followed allowed participants to engage with presenters directly and learn more about the workings of each tool.

Four in-depth training events were also held throughout the conference to provide participants with a more hands-on learning experience. These sessions, described below, covered a range of themes, including climate data analysis, information products, decision support, and capacity building.

Training session: Caribbean Online Risk and Adaptation Tool

Keith Nicholls, Caribbean Community Climate Change Centre

The Caribbean Online Risk and Adaptation Tool (CCORAL) is an online platform meant to encourage regional and national-level decision makers throughout the Caribbean to incorporate climate information into their work. The tool promotes climate-smart development and resilience, and can be used by government officials, the private sector, and non-governmental organizations alike.

Eight participants returned feedback surveys for this training session; results are found in Appendix 5.

Training session: Quantum Geographic Information System

Jennifer Boehnert, US National Center for Atmospheric Research

Climate and society are co-evolving in a manner that may place vulnerable populations at greater risk to weather and climate stresses. Understanding societal risks and vulnerabilities to weather hazards and climate change requires integration of spatial information from physical and social sciences. The GIS Program at the National Center for Atmospheric Research (NCAR) have developed research frameworks and spatial methods for the integration of diverse, multidisciplinary datasets, which are both quantitative and qualitative and exist at different spatial and temporal scales.

The GIS program at NCAR fosters interdisciplinary science, spatial data interoperability, and knowledge sharing using GIS technology. The goal of our program is to promote and support the use of GIS as both an analytical and infrastructure tool in atmospheric research. Our program has focused on the integration and analysis of climate model output with traditional GIS data, such as, socio-economic and infrastructure data, in order to facilitate interdisciplinary research and decision making. Quantum GIS (QGIS) is an Open Source user-friendly GIS application that provides a number of visualization, data management, data analysis, and map composition tools. GIS is an excellent tool for performing analysis as well as communicate research results.

Ten people returned feedback surveys for this training session; detailed information can be found in Appendix 5.

Training session: R

Rachel Lowe, Catalan Institute of Climate Sciences

R is a language and environment for statistical computing and graphics. The tool offers a range of statistical (linear and nonlinear modeling, classical statistical tests, time-series analysis, classification, clustering, etc.) and graphical techniques, and can be applied to a number of contexts. This training session analyzed the relationship between malaria incidence and rainfall and discusses the application of forecasts in disease prediction and control. The malaria incidence time series was also used to discuss the long-term trends in disease and vulnerability changes. The practical was be conducted using R, a free software environment for statistical computing and graphics.

Eight people returned feedback surveys for this training session; detailed responses can be found in Appendix 5.

Training Session: Climate Predictability Tool

Ángel Muñoz, International Research Institute for Climate and Society
Simon Mason, International Research Institute for Climate and Society
Cedric Van Meerbeeck, Caribbean Institute for Meteorology and Hydrology

The Climate Predictability Tool (CPT) provides a Windows package for constructing a seasonal climate forecast model, performing model validation, and producing forecasts given updated data. Its design has been tailored for producing seasonal climate forecasts using model output statistic (MOS) corrections to climate predictions from general circulation model (GCM), or for producing forecasts using fields of sea-surface temperatures. The software can also be used in more general settings to perform canonical correlation analysis (CCA) or principal components regression (PCR) on any data, and for any application.

Five people returned feedback surveys for this training session; detailed results can be found in Appendix 5.

SYNTHESIS

Remarks, Day 2

Guy Brasseur, Climate Service Center, Germany

Guy Brasseur opened the meeting by reminding us of the history of the Climate Services Partnership, including the first two conferences and the other activities that the CSP has engaged in over the past two years. Brasseur also offered a vision for the future of the Climate Services Partnership, which could include regional hubs and formal relationships with international organizations and the private sector. Brasseur stressed the role that the CSP plays in connecting climate services users, providers, researchers, and donors and the extent to which these connections help to improve the quality of climate services over time.

Remarks, Day 3

Chris Hewitt, UK Met Office

Chris Hewitt opened the session by reminding us of the charges made to the audience at the opening ceremony, and of the progress that had been made over the last two days. Hewitt reviewed the goals and ambitions of the Climate Services Partnership and discussed elements of the ICCS 3 that helped contribute to these goals. Hewitt also reminded the audience of the previous two conferences and offered suggestions regarding possible locations for the the fourth International Conference on Climate Services.

Reporting on the Tools Expo

Ana Bucher, World Bank

The Tools Expo offered conference participants an opportunity to discover quality, trusted tools, data, knowledge products, and learning initiatives related to climate services. It was also important in illustrating opportunities to enlarge a community of practice. The expo featured ~30 climate-related tools to support climate services. Tools were divided into four categories: climate information products, climate data analysis, decision support, and capacity building.

Throughout the expo, several concepts emerged in terms of the challenges of using and implementing tools for climate services. Firstly, in many cases tool development is stymied by large data/information gaps for countries, sectors, and topics. There are also issues pertaining to tool access, complexity, and sustainability. Finally, tools that integrate the economic valuation and costs associated with the production of climate services are also lacking.

To address some of these gaps, we need to think more about how users are/will/can apply the tools in their specific context. This could involve a needs assessment from end users. We also need better guidance on what/when/how to use each tool in the development planning process.

Bucher suggested that the CSP could play an important role in further developing a tools community by reviewing and organizing what exists, defining priorities, and aligning a more general and inclusive climate services tool development agenda. The CSP may also serve as a useful resource in providing feedback to tools developers on outstanding needs, and what is/is not working.

For ICCS 4, the CSP might work on pursuing standards that consider how the tools that support climate services are produced, used, and communicated. We should also work for a balance between the producers and users, and thus enhance the community of practice. Lastly, we should promote the integration of social elements within tool development.

Reporting from the CDEMA Conference

Liz Riley, Caribbean Disaster Emergency Management Agency

The CDEMA conference was focused on comprehensive disaster management; this includes integrated risk management, focused on people and activities from all sectors and a range of disasters. The conference is the region's premier event on disaster risk

management, drawing experts and practitioners from around the world. The goal is to reduce disaster risk and its associated losses. CDEMA recently completed its plan for comprehensive disaster risk management 2014-2024; the conference provided an opportunity for a local and regional strategy launch.

The conference positioned disaster risk reduction as an entry point for dealing with climate change, and asked how to move forward with integrated approach. The answer is rooted in governance, which is often disconnected at the national level – so that organizations need to work toward harmonization for more effective use of resources. This will involve joint planning among actors for both disaster risk reduction and climate change adaptation. This requires strong political leadership, and champions who can promote an integrated approach. The CDEMA conference brought climate change into their regional strategy and have drafted an MoU with the Caribbean Institute of Hydrology and Meteorology to facilitate this over time.

Priorities for climate services in the Caribbean

Michael Taylor, University of the West Indies, Mona

Michael Taylor summarized priorities for climate services in Caribbean, specifically with regard to three lessons involving the importance of the region's context. He described each lesson in terms demand, priorities, and parameters for climate services, and mentioned the challenge of limited resources and regional vulnerabilities. Taylor also acknowledge existing regional resources, services offered, and Caribbean-focused research, which should help to define the priorities of the climate services community. Finally, he pointed out that existing activities in the region along with current distribution patterns of infrastructure and human resources are important factors when delineating the parameters for climate services.

Identifying priorities for research

Lawrence Buja, US National Center for Atmospheric Research

Lawrence Buja discussed several key questions regarding priorities for research to support climate services. These included:

1. *What are the most pressing existing and emerging needs?*

We need to change our tools and begin to ask questions to potential users regarding what people do, and how, rather than what they need. We also need to better incorporate social sciences, especially with regard good practices in using seasonal

forecasting and decadal predictions. There are also pressing needs regarding the timeliness and accuracy of flood forecasts and associated early warning systems.

2. *What data and tools should be developed?*

We need to focus on scales and better understand the trade offs between perfect and good enough in different situations. We also have to understand how to build and foster credibility and trust, which is a function of the quality of the information, the standing of the provider, and time. Standards, assessments, metrics, and good practices are all important factors in achieving this. We still face many institutional challenges, our forecasting capabilities are weak, and we need to improve feedback to inform research.

3. *What mechanisms exist to bridge the CSP Research Priorities Working Group to disciplinary research communities?*

The working group can identify relevant research questions that entrain regional scientists and engage regional climate centers to design projects relevant to their communities. We will also need to take advantage of other internationally coordinated programs and develop networks that link climate service users with providers, funders, and researchers. We also have to make the climate services enterprise relevant and interesting to other communities.

Improving stakeholder engagement

Walter Baethgen, International Research Institute for Climate and Society

Walter Baethgen emphasized the importance of understanding the networks already in existence in places where climate services are active. Identifying the links and chains in the networks, the actors and their specific priorities, as well as functions and feedbacks, is key in providing useful climate information through integrated decision support systems. Baethgen underlined the need of more and better communication, the identification of problems and demands, and the strengthening or creation of links in the networks wherever needed.

Baethgen also suggested that a "change in culture" is also needed. For example, it is critical to ask the right questions to the stakeholders, such as "what problems/challenges do you face that climate knowledge can assist?" in lieu of the more traditional question, "what are your needs?". Baethgen concluded with a reminder that stakeholders oftentimes do know what they need, and that the research community must reshape the questions it asks to better address its audience.

Establishing good practices

Bruce Hewitson, Climate Systems Analysis Group, University of Cape Town

Bruce Hewitson began with a review of conference focal areas surrounding good practice including: examples of case studies, portal demonstrations, discussions around the definition of climate services, and the difficulties of M&E work. Less visible, Hewitson said, were discussions of failures and bad practices. He continued with the needed foundation for establishing good practices, beginning with the need to define requisite references (how do we define "good"?). Next, he urged the community to proceed pragmatically, rather than idealistically, and emphasized that we must seek to meet stakeholder needs while always maintaining humility, transparency, and honesty in product/service delivery.

Hewitson continued with recommended next steps toward establishing good practice, beginning with the need to establish criteria. This involves drafting white papers and circulating that text for comment broadly throughout the climate-service community. Criteria then must be published under the auspices of an independent and recognized authority. Next, we must grow awareness, sensitize practitioners, and foster inclusivity. Finally, we must grow community capacity to include the efforts of all players across all levels. Hewitson notes that context is paramount and there are multiple ways to approach individual cases that will allow for an articulation of examples, attributes, and conceptual frameworks for operational climate services.

Building capacity for climate services

Emily CoBabe-Ammann, University Corporation for Atmospheric Research

The concept of capacity building is too often unaddressed, though it is critically important across all levels of the climate services value chain. Good science is a project's first step, but the actual measure of success is the project's ability to engage and work with end users to enact change.

There are several barriers to building capacity. Firstly, there is a lot of redundancy in terms of documentation, training, and education. Second, we lack the human resources needed to build capacity. At this stage in the development of climate services, we should expect chaos across all levels of the value chain. The challenge is not to manage the chaos, but to manage communication across the chaos – how do we find each other, and how do we find our users (and how do they find us)?

To overcome these barriers, we must work to develop communities of practice, and thus share resources and trust across the value chain (and throughout user communities). We also need to work on scaling efforts; "training the trainer" and "training the team" are both very important. There is also a role for virtual space in scaling efforts, though these initiatives are still emerging. Eventually, online resources will become too many, and will require a librarian of some kind to help users navigate their options.

Directing investment to build climate services

John Furlow, United States Agency for International Development

John Furlow discussed a number of the conference takeaway messages around investment in climate services. Firstly, successful investments in climate services involve fostering a community of collaboration to reach all aspects of the value chain. The work in Jamaica, for instance, is an example of an effective working group that teaches us the importance of investing in user/client involvement and in breaking down sectoral/agency silos. It is also important to engage influential policy makers. Second, once successful climate services are in place, we need to scale up, but this comes with a cost. Third, monitoring and evaluation beginning with a project's initiation is important in evaluating the value of our investments.

Furlow continued with a discussion of donor coordination. Many investments are regionally clustered, but this does not ensure that support is coordinated. It's important to identify what is being funded and what is needed. This should include problem-informed research, data and information, communication and collaboration, capacity building, evaluation and assessment, and development. All components are critical for effective climate services. Furthermore, coordination should be driven by host countries. Lastly, in terms of good practices, investment should be put toward

collaboration itself, which relies on inclusive planning processes that lay out goals and move from projects to services.

Conclusion and next steps

Stephen Zebiak closed the meeting by the last speakers for their efforts in summarizing the range of conversations that took place several days, and in adding their own analysis to the conference focal areas, which include identifying priorities for research; improving stakeholder engagement; establishing good practice; building capacity; and prioritizing investment. These focus areas clearly generated a lot of discussion during the conference itself and will continue to be important as we work to transition from research and demonstration to sustained climate services in both the developed and developing world.

Zebiak urged the partnership to think about what individual organizations and the climate services community as a whole can do to address needs, gaps, and opportunities. He also suggested that we follow up on suggestions for collective efforts, urging the CSP to use the momentum of the conference to take action individually and collectively. He articulated a hope that the CSP and the ICCS process will continue to create a catalytic space where community can gather to share current experiences, discuss new ideas, and plan activities as a larger collective.

Moving forward, the CSP will continue to work along the three goals that were articulated at the first International Conference on Climate Services in NY. Specific priorities for the CSP in the coming year include:

1. Sharing knowledge
    a. The CSP will continue to work on knowledge sharing activities, including the website, newsletter, and webinars.
    b. It will also continue to share knowledge by collecting and distributing case studies, assessments, and guidance documents, etc.
2. Generating new knowledge
    a. The CSP will continue with existing efforts to generate new knowledge on climate services, including regarding evaluation and economic valuation.
    b. It will also continue to pursue new opportunities, including the development of working groups around ethics, the prioritization of research topics, and the establishment of good practice.

3. Fostering connections

    a. The CSP will continue to foster an international community of practice on climate services;
    b. It will also strive to support regional (e.g., European CSP, North American CSP, etc.) and sectoral (e.g., health, agriculture, etc.)
    c. It will strive to hold a meetings at sectoral conferences, drawing a community together with potential users of climate information separate from the ICCS)
    d. The CSP will look for opportunities to hold a fourth ICCS.
    e. The CSP will continue to foster connections with the Global Framework for Climate Services, and support the efforts of that international initiative where possible.
    f. The CSP will strive to broaden the community of practice, fostering links between our community and other entities including the Climate Development Knowledge Network, international development programmes (PPCR, UNDP) and broad-scale research efforts such as Future Earth.

APPENDICES

Appendix 1: Agenda

WEDNESDAY, *December 4*

8:30 - 9:00 AM	**Registration**					
WELCOMING CEREMONY						RM# C6
9:00 - 9:05	**Opening remarks** | Jeffery Spooner Director, Meteorological Service of Jamaica					
9:05 - 9:10	National anthem					
9:10 - 9:15	**Welcome to the city** | Glendon Harris Mayor, Montego Bay					
9:15 - 9:25	**Greetings** | Jeannette Vail Acting Mission Director USAID/Jamaica					
9:25 - 9:40	**Keynote address** | Minister Robert Pickersgill, MP Ministry of Water, Land, Environment, & Climate Change, Jamaica					
9:40 - 9:45	**Vote of thanks** | Jeffery Spooner Director, Meteorological Service of Jamaica					
9:45 - 10:15	***Coffee break***					
OPENING CEREMONY						RM# C4-5
10:15 - 10:20	**Welcome from the Climate Services Partnership** | Stephen Zebiak International Research Institute for Climate & Society					
10:20 - 10:40	**Climate services in the Caribbean** | David Farrell Caribbean Institute for Meteorology & Hydrology					
10:40 - 11:00	**Climate services around the world** | Filipe Lucio Global Framework for Climate Services					
11:00 - 11:30	**National-level climate services for agriculture** | Alicia Martins Ministry of Livestock, Agriculture, & Fisheries, Uruguay					
11:30 - 11:50	**Conference roadmap** | Stephen Zebiak International Research Institute for Climate & Society					
11:50 AM - 12:00 PM	**Introduction to the Tools Training Expo** | Catherine Vaughan International Research Institute for Climate & Society					
12:00 - 1:00	**Tools Expo**, Part 1					RM# C1, C2, C6
1:00 - 2:00	***Lunch***					
2:00 - 3:30	**A.1** Sector Studies: **Drought early warning information systems: reducing drought risks in a changing climate**		**A.2** Working Groups: **Climate services evaluation**		**A.3** Project Reports: **Linking climate services to resilience building: the PPCR experience**	**A.4** Tools Training: **Climate Predictability Tool (CPT) training**
	(1 of 2)	RM# C6		RM# C1	RM# C2	(1 of 2) RM# C4-5
3:30 - 4:00	***Coffee break***					

WEDNESDAY, *December 4 (continued)*

4:00 - 5:30	**B.1** Sector Studies: **Drought early warning information systems: reducing drought risks in a changing climate**	**B.2** Working Groups: **Climate services and triggers: challenges and opportunities in scaling processes**	**B.3** Project Reports: **Joint Programming Initiative Climate**	**B.4** Tools Training: **Climate Predictability Tool (CPT) training**
	(2 of 2) RM# C6	RM# C1	RM# C2	(2 of 2) RM# C4-5
5:30 - 6:00	**Tools Expo Poster Session**			
6:00 - 8:00	**Reception**			

THURSDAY, *December 5*

8:40 AM	**Opening Remarks** | Guy Brasseur Climate Service Center Germany			RM# C4-5
9:00 - 10:30	**C.1** Sector Studies: **Are coastal zones well managed and resilient in the face of climate change?**	**C.2** Working Groups: **European Climate Services Network**	**C.3** Project Reports: **Climate services for the agricultural sector in Jamaica**	**C.4** Tools Training: **R training**
	(1 of 2) RM# C6	RM# C1	RM# C2	(1 of 2) RM# C4-5
10:30 - 11:00	***Coffee break***			
11:00 AM - 12:30 PM	**D.1** Sector Studies: **Are coastal zones well-managed and resilient in the face of climate change?**	**D.2** Working Groups: **Climate services and the private sector**	**D.4** Project Reports: **Integrated climate risk management at the UNDP**	**D.4** Tools Training: **R training**
	(2 of 2) RM# C6	RM# C1	RM# C2	(2 of 2) RM#C4-5
12:30 - 1:30	***Lunch***			
1:30 - 2:30	**Tools Expo**, Part 2			RM# C1, C2, C6
2:30 - 4:00	**E.1** Sector Studies: **The role of climate in disease decision support systems**	**E.2** Working Groups: **Scaling up climate services for farmers: current challenges & best practices from Africa & Latin America**	**E.3** Project Reports: **Informing DfID's research funding for early warning systems and risk assessment of weather-related hazards**	**E.4** Tools Training: **Quantum Geographic Information Systems (QGIS) training**
	RM# C6	RM# C1	RM# C2	RM# C4-5
4:00 - 4:30	***Coffee break***			
4:30 - 6:00	**F.1** Sector Studies: **Climate services for better health: moving from risk assessment to risk management**	**F.2** Working Groups: **Prioritizing research in support of climate services**	**F.3** Project Reports: **Participatory development of seasonal forecast action alert for the Caribbean**	**F.4** Tools Training: **Caribbean Online Risk and Adaptation Tool (CCORAL) training**
	RM# C6	RM# C1	RM# C2	RM# C4-5
6:00 - 7:30	**SIDE EVENT: Investing in climate services**			

FRIDAY, *December 6*

9:00 - 9:15 AM	**Opening remarks** | Chris Hewitt UK Met Office	RM# C4-5
9:15 - 9:30	**Reporting on Tools Expo** | Ana Bucher World Bank	
9:30 - 9:45	**Reporting from the CDEMA Conference** | Saudia Rahat CDM Harmonized Implementation Programme	
9:45 - 10:00	**Priorities for Climate Services for the Caribbean** | Michael Taylor University of the West Indies, Mona	
10:00 - 10:30	***Coffee Break***	
REPORTING ON CONFERENCE FOCAL AREAS:		
10:30 - 10:45 am	**Identifying priorities for research** | Lawrence Buja US National Center for Atmospheric Research	
10:45 - 11:00 am	**Improving stakeholder engagement** | Walter Baethgen International Research Institute for Climate & Society	
11:00 - 11:15 am	**Establishing good practice** | Bruce Hewitson Climate Systems Analysis Group University of Cape Town	
11:15 - 11:30 am	**Building capacity for climate services** | Emily CoBabe-Ammann University Corporation for Atmospheric Research	
11:30 - 11:45 am	**Directing investment to build climate service** | John Furlow United States Agency for International Development	
12:00 - 12:30	**Discussion and conclusions** | Stephen Zebiak International Research Institute for Climate & Society	
12:30	**Close**	
	SIDE EVENT: Climate Services Partnership: Recent activities and next steps	

Appendix 2: Participant List

International Conference on Climate Services 3
December 4-6, 2013
Montego Bay, Jamaica

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Appendix 3: Side events

Climate service ethics

December 3, 2013

Session leads: Bruce Hewitson, Climate Systems Analysis Group, University of Cape Town; Stephen Zebiak, International Research Institute for Climate and Society

Climate service ethics engage the direct and indirect consequences associated with climate service provision. Many applications of climate services are likely to have high human impact, often for multiple stakeholder groups that may have different or even competing interests. What constitutes good practice in climate services delivery?

Among the questions that could be posed regarding existing climate services are:

- Who is being served?
- Who will likely be impacted and how?
- Are the interests of different stakeholder groups represented equitably?
- Is there a means to assure the quality of information and services being provided?
- In addressing these and related questions, which groups – information providers, facilitators, intermediaries, and various users – should be responsible, and for what?

The session began with a series of presentations, detailed below:

Decision-making under uncertainty
Mickey Glantz, University of Colorado

Policy makers need information about the foreseeable future in order to make informed decisions. With regard to the impacts of climate change on society, there remains considerable uncertainty about the intensity, duration, frequency and magnitude as well as location of those impacts.

As with issues that they face on a weekly basis, policy makers are accustomed to make decisions under uncertainty – that is, without the luxury of having in hand perfect information on which to base their decisions. Glantz discussed issues related to decision making under uncertainty, including the various kinds of risks (knowable, foreseeable, unknown) that are involved.

Glantz highlighted the importance of developing trust between information users and providers, and stressed that end-to-end service provision should be complemented with a feedback loop from users to service providers. He also talked about the fact that good decisions can have politically bad outcomes.

Exploring climate service ethics
Filipe Lucio, Global Framework for Climate Services

Filipe Lucio presented the concept of climate services and discussed how conflicting messages and inefficiencies could lead to negative outcomes. He presented MeteoAlarm, a European site that allows users to view warnings being issues in any of participating countries, which tries to combat this.

Lucio also talked about the need for information to be validated before it is provided to users and highlighted the need for honest brokers to operate in this space. He stresses that climate information, in many cases, should be a public good.

Lucio also stressed that we should not oversell the value of climate services; he pointed out, for instance, that the newly elect chair of the GFCS's Intergovernmental Board on Climate Services, the head of the met service in Norway, believes climate services are of no use to users in his latitudes.

Taking science to society: participatory game
Erin Coughlan, Red Cross Red Crescent Climate Centre

In the participatory game presented by Erin Coughlan, certain players represented providers of climate information and others represented potential users. With some information about the "accuracy" of their "model," the providers tried to sell their particular product to potential users. The game highlighted the extent to which providers are able to market their product in ways that are confusing and potentially misleading to potential users.

Climate service ethics
Nancy Tuana, Pennsylvania State University

Nancy Tuana defined ethics as guiding individuals and groups regarding what is right and wrong, and serve as the goals and ideals we aspire to and by which we measure ourselves, others, and societies.

Tuana discussed several levels in which ethics intersect with climate services; this includes research integrity (i.e., conflicts of interest, and issues of proprietary knowledge) as well as broader issues, including questions of justice, the precautionary principle, and the enhancement of social capital. She stressed that identifying an ethical framework for climate services involves asking the question of who we want to serve and what we want to sustain. She also discussed the interplay between knowledge and ethics, and the manner in which problems are framed (presumed to be knowledge-based) can either include or exclude different actors and interests (ethics).

Tuana introduced several concepts, including coupled ethical-epistemic analysis, and robust decision making.

Conclusions
The discussion was relatively wide ranging but underscored the fact that understanding value systems is far beyond the traditional training of climate scientists and is something that should be addressed, perhaps in training but also in collaborations.

Discussions stressed the need for some kind of standards or stamp of integrity regarding information delivered in the context of climate services; this applies both to climate service providers and to middlemen, or "honest brokers." Equally, the discussions supported working toward the development of a code of conduct for climate services delivery. The general outlines for action on these fronts, as presented in the Concept Note (below), were endorsed by the group, with emphasis on inclusion of key stakeholder groups, and review of relevant codes of conduct developed by other professional communities.

The GFCS office offered to promote and to support the ongoing process.

Climate Service Ethics Concept Note
Climate Community Code of Conduct (4C) for Service Providers

Definitions of climate services
....management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of science-based climate information and prediction into planning, policy and practice on the global, regional and national scale (Global Framework for Climate Services).

Climate science is now at the stage where it can provide global services to meet the adaptation needs of Government, businesses and the public, at regional and local levels (UK Met Office).

A climate service is a decision aide derived from climate information that assists individuals and organizations in society to make improved ex-ante decision-making. A climate service requires appropriate and iterative engagement to produce a timely advisory that end-users can comprehend and which can aid their decision-making and enable early action and preparedness. Climate services need to be provided to users in a seamless manner and, most of all, need to respond to user requirements (Hellmuth et al., 2011).

Towards a code of conduct
Climate science has evolved to the point whereby the knowledge is potentially 'actionable' and able to deliver social benefits (Meinke et al., 2006). The expectation is that service providers will help stakeholders to minimise risks and maximise opportunities in resource provision, infrastructure design, and planning. With such influence also comes great responsibility to ensure that the science is used appropriately and proportionately to achieve good outcomes.

However, there is recognition within the climate science community that there is scope for subjectivity on the part of individual service providers about what is appropriate and proportionate. Such variance arises because of many factors including: ignorance; professional differences in opinion; or tensions between financial, contractual and moral imperatives. There may also be proprietary concerns that run counter to scientific norms of peer review, transparency and reproducibility.

This note proposes seven steps towards a climate community code of conduct. It is intended to provoke discussion and action. The ultimate objective is to achieve a workable, not academic, set of principles and standards that would be owned by climate science producers, translators, and users alike.

Next steps
1. **Establish a steering group** to oversee the drafting of a Terms of Reference and roadmap for delivery of the Code. This group should be reflective of the many constituencies involved in climate science production, dissemination and use. There should also be representation of different geographic regions and priority sectors (defined by WMO as agriculture and food, disaster risk reduction, health and water).

2. **Review other codes of conduct** already enacted by related agencies (e.g., FAO, NOAA). Lessons might also be learned by referring to the scope and language of other sectors (e.g., Press Complaints Commission Editors' Code of Practice). This exercise would help to strike the right balance between high-level principles versus operational standards, and between rigidity of codification versus flexibility of interpretation.

3. **Define the entities and domains** covered by the code. Entities might include providers, disseminators and communicators, stakeholders, and even the environment. Domains might include the ethics of society, of interventions, of analysis, and of professional/personal practice. Any assumptions should be made explicit, for instance about expected standards of scientific integrity.

4. **Define guiding principles** for climate service providers. These might be aspirational such as promoting trust, cooperation and solidarity amongst institutions, minimising harms, and fairness in the treatment of different stakeholder groups. This could reveal potential conflicts of interest, for example, between providing services as opposed to building capacity.

5. **Define operational standards** for climate service providers. The Code might address generic concerns pertaining to the provenance of information, accuracy of the product, transparency of caveats and uncertainty, expected standards of utility – essentially legitimacy, saliency and credibility dimensions. Value-laden terms such as "must" and "should" need to be used consistently.

6. **Map a pathway to ratification** of the Code. This presumes community agreement about the appropriate governing body (if any). Alternative models of self-regulation and accountability could be considered. One option might be to move towards a system of accreditation by professional institutes. This raises questions about level of signature (potentially governments, agencies and corporations, individual consultants), expiration period (project level, fixed-term, or open-ended) and legal implications.

7. **Establish a framework for periodic review** and updating of the Code's guiding principles and operational standards.

Resources

Climate Service UK: http://www.metoffice.gov.uk/climate-service-uk

Global Framework for Climate Services: http://www.gfcs-climate.org/

Hellmuth, M.E., Mason, S.J., Vaughan, C., van Aalst, M.K. and Choularton, R. (eds) 2011. A Better Climate for Disaster Risk Management. International Research Institute for Climate and Society (IRI), Columbia University, New York, USA.

Meinke, H., Nelson, R., Kokic, P., Stone, R., Selvaraju, R. and Baethgen, W. 2006. Actionable climate knowledge: from analysis to synthesis. Climate Research, 33, 101-110.

Press Complaints Commission Editors' Code of Practice: http://www.pcc.org.uk/cop/practice.html

World Meteorological Organisation Special Issue on Intergovernmental Board on Climate Services: http://library.wmo.int/opac/index.php?lvl=bulletin_display&id=2738

Climate information needs for the large-scale agricultural sector

December 3, 2013

Session lead: Emily CoBabe-Ammann, University Corporation for Atmospheric Research

Kanta Kumari, World Bank

World Bank work is closely tied to agriculture-dependent communities, which are, in turn, closely tied to various climatic forcings. All of the World Bank funding areas in agriculture thus have some level of sensitivity to climate-induced events. This is especially true on the agricultural supply side, but is also true in marketing and trade.

However, climate information is not yet included as much as it should be in World Bank work. Moving forward, we need to link project design with the climate services value chain. More specifically, we must look at the entire agricultural supply chain and pinpoint where climate services can be useful. The more we do this, the more we will be able to incorporate climate services into investment.

Caspar Ammann, NCAR

How do we ensure that the providers of climate services understand the problems that need to be addressed, and that users understand what is available and potentially helpful to them? We must put emphasis on translation, which will involve the production of useful climate products that are both precise and able to communicate uncertainty.

That is, data alone is not enough – we must also think about application. This involves thinking about the decision cycle and acknowledging different timescales: seasonal (when to plant), annual (what to plant), and decadal (infrastructure). We must also think about spatial challenges (field scale to global market) and different ways to communicate the thresholds that define climate sensitivities.

Adrian Trotman, CIMH

CAMI aims to increase/sustain agricultural productivity at the farm level in the Caribbean through improved applications of climate information. This involves a range of activities including rainfall prediction, pest/disease forecasting, and the preparation/delivery of newsletters.

Extension services could serve as an effective bridge between the climate community and the farming community. However, very few extension workers know where to start to begin incorporating climate information into decision making. To begin to fill this gap, CIMH is planning to host a training session for extension officers, and thus facilitate the growth of this bridge. Human resources and structural change are both necessary for the continued development of bridge organizations.

CSP "learning journey" to Mafoota

December 3, 2013

On Tuesday afternoon, Elvis Grey of the Jamaican Rural Agricultural Development Agency (RADA) led a "learning journey" of about 35 conference participants to Mafoota, a small farming community in St. James Parish, just outside of Montego Bay. The

journey was funded by the CGIAR's research program on Climate Change, Agriculture, and Food Security (CCAFS).
Visiting the farms, which are organized in a cooperative and supply the nearby hotel sector, served as a good reminder of the motivation behind the development and implementation of climate services. Participants were able to see the workings of the local agricultural production system and learn about the local adaptive capacity and needs for sustaining agricultural production. Farms in Mafoota mainly produce vegetables including romaine lettuce, cabbage, sweet potato, yam, bananas, plantains, and callaloo. Farms are fed in part by an irrigation system, though this system irelies on local streamflow and erratic rainfall in the past few years has led to the drought-induced water stress.

Generally, drought and flood are both challenges posed by a variable climate. The Mafoota community has taken several adaptive measures to protect themselves in the future; a large man-made water pond that fills via solar-powered pumps was funded by the European Community and GEF funds and is one example of local efforts to increase resilience. Although agrometeorological data is not accessible for most of the Jamaican farming community, RADA has been working with the Meteorological Service of Jamaica, the Ministry of Water, Land, Environment, and Climate Change, and a number of international organizations to produce and distribute locally-relevant climate information materials.

More on this side event here: http://www.climate-services.org/iccs/iccs-3/post-conference-coverage-climate-services-farmers-and-iccs-visit-mafoota

Investing in Climate Services in Developing Countries

December 5, 2013

Session lead: Haresh Bhojwani, International Research Institute for Climate and Society

Purpose

Given the diversity and urgency of developing country priorities and needs, and the breadth of approaches, preferences, and limitations inherent to each funding opportunity, the session tried to provide:

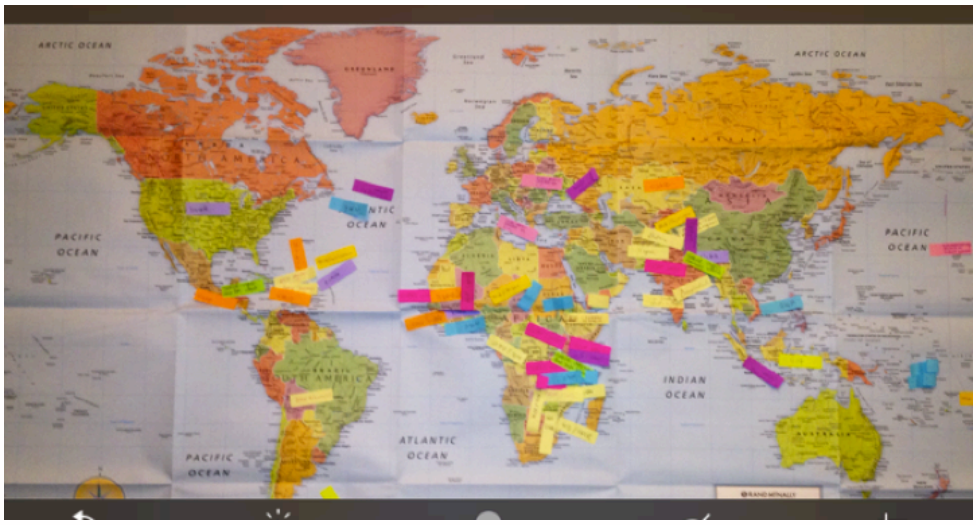
1) an opportunity for developing countries, donors, investors, and climate services initiatives to explore and discuss challenges in coordinating investments toward sustainable climate services.

And,

2) an opportunity to propose mechanisms and strategies to coordinate investments to attain development impacts sustainably.

Map exercise

Participants were asked to use a world map to identify where they are actively involved in projects:



Investments by NOAA, USAID, World Bank, WMO, UNDP, GIZ, HCF, CSC and CCAFS were represented in this activity. There were initial discussions about coordinating in the overlapping areas.

Investment Typology Discussion Summary

No agency, investor or implementer has sufficient resources or capacity to implement climate services entirely and sustainably. Some have a strong focus on only some aspects of the problem (e.g. data, training or communications), others are interested in a single sector or problem (e.g. food security, index insurance). Collaboration may provide a partial solution to this problem if capacities and resources can be coordinated to achieve broader impacts.

A sustainable and useful climate service needs several basic attributes to meet certain basic standards. If we can agree to what these attributes are we could use this typology to diagnose weaknesses in current projects and services, we could identify areas that need attention, and we would have a blueprint for coordination. A straw typology of investment areas was discussed and found to be useful. It proposed the following categories of investment:

- Research – to develop new knowledge to inform climate related problems.
- Data and Information – that is available, accessible, usable and useful.
- Communication and Collaboration – mechanism to engage stakeholders.
- Capacity Building – for providers, stakeholders, users.
- Evaluation and Assessment – how to know what works/fails and why.
- Knowledge Capture and Sharing – a sharing methods and standards.
- Sustainable Business Models – planning for the long-term.

Discussion of other mechanisms and strategies

1. *GFCS.* The Global Framework has made strides in establishing mechanisms for coordination. The framework offers an opportunity to align (where it is active) with national level efforts. At the global scale, the GFCS invited participation in its partner consultative body.

2. *Finance Ministries* are a good mechanism for coordination, and development banks can frequently provide access.

3. *Met Services* were encouraged to take charge of explicit coordination efforts when approached by different partners interested in investing in climate services.

4. *Working Groups.* The successes of Jamaica and several other countries were partially due to the long-term, persistent, commitment of several agencies to meet and work together on solving a problem. This also provided them with an avenue to coordinate their resource strategies.

5. *Stepped Graduation.* Since donors and investors typically have a short time line for investment (1-5 year projects), it is important to have a sense of "up to what level of capacity" the investment is expected to raise the climate service – and develop a financial sustainability plan for that level of service.

Climate Services Partnership: Recent activities and next steps

December 6, 2013

Introduction

Steve Zebiak introduced the session and its goal of generating discussion regarding the future of the CSP.

Recent activities

Catherine Vaughan reviewed recent activities of the CSP, as they pertained to the three goals set out at the first ICCS. This includes:

1. Facilitating connections: monthly teleconferences; quarterly newsletter; webinars; and face-to-face meetings, including ICCS.
2. Sharing existing knowledge: case studies, guidance materials, survey activity
3. Generating new knowledge: economic valuation; "mid-level" evaluation

A vision for the future

Guy Brasseur presented a possible vision for how the CSP might grow in the future. This included a structure involving a steering committee headed by a chair, a secretariat, several working groups, sectoral, and regional groups, and a body of clients/sponsors. The goal is not to create a bureaucracy, but rather to manage activities in a more streamlined way. We must also identify the various steps that the CSP should take in order to begin a process toward achieving these goals.

Relationship with the GFCS

Filipe Lucio spoke about how the CSP might relate to the GFCS. As the CSP includes both governmental and non-governmental organization, it is complementary to GFCS, which is a more formalized, intergovernmental organization. Moving forward, the GFCS and CSP should coordinate to achieve their greatest collective impact. For example, in the realm of further outreach to the user community, the CSP may serve as a facilitator in connecting communities and groups further down on the value chain with decision makers at the

GFCS. It was proposed that the GFCS and CSP secretariats collaborate on developing a white paper delineating the interrelationships between the two programs and possible mechanisms to establish more concrete linkage.

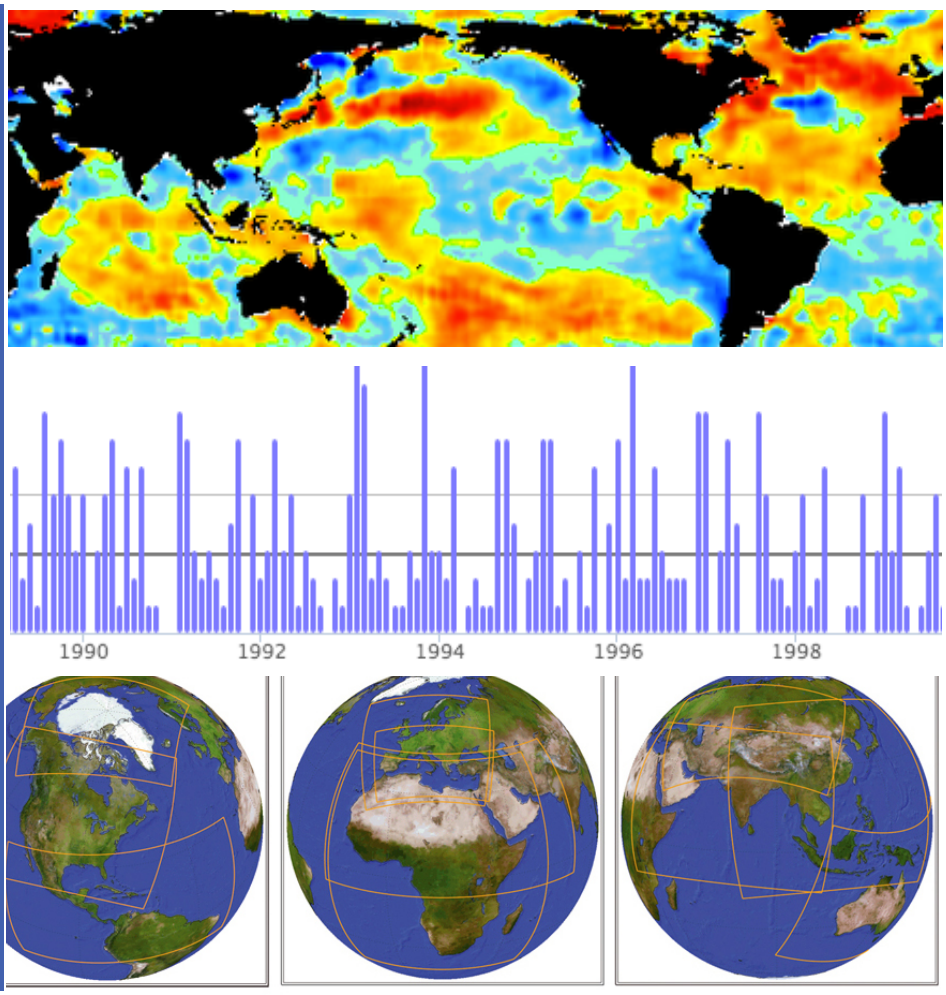
Sustainability

The CSP is sustainable to the extent that it continues to serve the needs and interests of its members, and can attract and maintain funding for its activities and its secretariat. It is important that funding for the secretariat be extended beyond USAID. USAID would also like to see more direct work with users and practical results (e.g., along the lines of this year's work in Jamaica). CSP should also continue in documenting connections, facilitating action, and increasing the traction of nascent climate services.

How do we create a business model that is not entirely dependent on one partner? As the CSP develops, we should put forward a proposal that is directed toward multiple sources of funding. Several meeting participants expressed interest in developing joint projects, and others were interested in investing in a graduate fellowship/internship supporting students working in disciplines across the climate services field. This may serve as a cost-effective way to foster a community of experts. Working to engage philanthropists may also be a good avenue for future funding. Lastly, it was noted that the GFCS trust fund may be able to support activities well aligned with GFCS implementation priorities.

Appendix 4: Tools Expo circular

ICCS 3 tools expo



ICCS THE INTERNATIONAL CONFERENCE ON CLIMATE SERVICES

The Third International Conference on Climate Services (ICCS 3) features the first Tools Expo of the Climate Services Partnership.

The Expo will provide conference participants with an opportunity to learn about a range of tools that can assist in the prioritization, production, and use of climate services. It will also allow those who have developed or are familiar with specific tools to share their expertise with the wider community.

The Expo will begin with a series of short presentations by tool experts. Participants will also be able to engage with presenters directly and learn more about the workings of each tool at the poster session. In-depth training events will be held throughout the conference to provide participants with a more hands-on learning experience. These sessions will cover a range of themes, including climate data analysis, information products, decision support, and capacity building.

This guide can be used to learn more about the event and navigate the various sessions.

tools expo part 1

Wednesday, December 4, 2013, 12:00 – 1:00 pm

The ICCS 3 Tools Expo includes a series of brief presentations meant to introduce participants to a number of tools related to climate services. On each day of the Expo, participants will be able to attend presentations in two of three rooms; when the bell rings after the first round of presentations, participants should please switch rooms for the second round. Participants will be able to learn about the tools they do not get to hear about during the poster session.

Room C1: Information Products, Part 1

Climate Analysis and Applications Map Room

Tufa Dinku, International Research Institute for Climate and Society (IRI), tufa@iri.columbia.edu
About: The Climate Analysis and Applications Map Room consists of 3 map-rooms: Climate Analysis, which provides information on mean rainfall and temperature at national and sub-national levels; Climate Monitoring, which enables monitoring of the current season; and Climate Forecast, which translates seasonal forecasts to user-friendly values.
Web link: Ethiopia: http://www.ethiometmaprooms.gov.et:8082/maproom/
Tanzania: http://maproom.meteo.go.tz/maproom/

Climate Information Platform (CIP)

Bruce Hewitson, Climate System Analysis Group (CSAG), (hewitson@csag.uct.ac.za)
About: The Climate Information Platform (CIP) is a web interface that provides structured guidelines alongside climate information visualizations and spatial maps. In doing so, CIP facilitates the simple but effective use of climate information, which is meant to transcend traditional climate data delivery.
Web link: http://cip.csag.uct.ac.za/webclient2/app/

Beet Armyworm Pest Outbreak Forecasting Model

Michelle Sherwood, Ministry of Agriculture and Fisheries, mishanton@yahoo.com, ppu@moa.gov.jm
Organization: Research and Development Division, Ministry of Agriculture and Fisheries, Jamaica
About: This system was developed for St. Elizabeth, Jamaica in response to repeated pest outbreaks in onion and scallion crops from 2009-12. The system involves monitoring and uploading pest and meteorological data, data analysis, and media and information dissemination regarding anticipated outbreaks and preventative measures.

NOAA's Quarterly Climate Impacts and Outlooks

Meredith Muth, National Oceanic and Atmopsheric Administration (NOAA), Meredith.F.Muth@noaa.gov
About: NOAA's Regional Climate Services (RCS) program leads the production of quarterly syntheses of climate impacts and outlooks for many regions of the United States and in partnership with Canada and Mexico. These syntheses highlight recent and current climate issues at regional scales alongside NOAA data and services supporting regional customers.
Web link: http://www.ncdc.noaa.gov/climate-information/regional

Room C2: Climate Data Analysis

Providing Regional Climates for Impacts Studies (PRECIS)

Jane Strachan, UK Met Office, jane.strachan@metoffice.gov.uk
About: PRECIS is a regional climate modeling system designed to run on a Linux-based PC. The system generates detailed climate change projections, and can be used in the field of climate change adaptation, which requires high-quality climate change information, often with in-depth spatial detail.
Web links: http://www.metoffice.gov.uk/precis/

R

Rachel Lowe, Institut Català de Ciències del Clima (IC3), rachel.lowe@ic3.cat
About: R is a language and environment for statistical computing and graphics. The tool offers a range of statistical (linear and nonlinear modeling, classical statistical tests, time-series analysis, classification, clustering, etc.) and graphical techniques, and is very extensible.
Web links: General information: http://www.r-project.org/

IRI Data Library

Ángel Muñoz, International Research Institute for Climate and Society (IRI), agmunoz@iri.columbia.edu
About: The IRI/LDEO Climate Data Library contains over 300 datasets from a variety of earth science disciplines and climate-related topics. The Data Library allows the user to access and analyze datasets, visually monitor present climate conditions, and download data in a variety of commonly used formats.
Web links: http://iridl.ldeo.columbia.edu/

Quantum Geographic Information Systems (QGIS)

Jennifer Boehnert, University Corporation for Atmospheric Research (NCAR), boehnert@rap.ucar.edu
About: QGIS is an Open Source user-friendly GIS application that provides a number of visualization, data management, data analysis, and map composition tools. The GIS Program at NCAR has developed a number of research frameworks and spatial methods for the integration of diverse, multidisciplinary datasets.
Web link: http://www.qgis.org/en/site/

Climate Predictability Tool (CPT)

Ángel Muñoz, International Research Institute for Climate and Society (IRI), agmunoz@iri.columbia.edu
About: CPT provides a Windows package for constructing a seasonal climate forecast model, performing model validation, and producing forecasts given updated data. It is specifically designed for producing seasonal climate forecasts.
Web link: http://iri.columbia.edu/our-expertise/climate/tools/cpt/

Room C6: Decision Support, Part 1

The Caribbean DEWETRA Platform

Adanna Robertson-Quimby, Caribbean Institute for Meteorology and Hydrology (CIMH), arobertson@cimh.edu.bb
Shawn Boyce, Caribbean Institute for Meteorology and Hydrology (CIMH), sboyce@cimh.edu.bb
About: The Caribbean DEWETRA Platform is a real-time data and information system used for hydro-meteorological risk forecasting, environmental monitoring, and disaster risk mitigation. The tool fuses hazard and vulnerability information at different spatial and temporal scales to support disaster management decision making processes.

Regional Agricultural Forecasting Toolbox (CRAFT)

James Hansen, Climate Change, Agriculture, and Food Security (CCAFS), jhansen@iri.columbia.edu
About: CRAFT is a software platform that supports 1) spatial input data and spatial crop simulations; 2) the integration of seasonal climate forecasts; 3) spatial aggregation and probabilistic analysis of forecast uncertainty; 4) the calibration of model predictions from historic agricultural statistics; and 5) analysis and visualization.

Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL)

Anne Hammill, International Institute for Sustainable Development (IISD), ahammill@iisd.ca
About: CRiSTAL is a project-planning tool that helps users design activities in support of climate adaptation at the community level. CRiSTAL seeks to systematically assess the impacts of a project on the local determinants of vulnerability and exposure, so that project planners and managers can design activities that foster climate adaptation.

Decision support System for Coastal Climate Change Impact Assessment (DESYCO)

Antonio Marcomini, Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC), marcom@unive.it
About: DESYCO is an open-source GIS-based decision support system for the assessment and management of climate change impacts in coastal areas. DESYCO, which incorporates data from different scenarios, models, and datasets, can be integrated within open source or commercial GIS software and applied at a range of spatial scales.
Web link: http://www.cmcc.it/models/desyco

Climate Change Knowledge Portal (CCKP)

Ana E. Bucher, World Bank, abucher@worldbank.org
About: The CCKP provides a web-based platform to assist in capacity building and knowledge development. The aim of the portal is to help provide development practitioners with a resource to explore, evaluate, synthesize, and learn about climate-related vulnerabilities and risks at multiple levels of detail.
Web link: http://climateknowledgeportal.worldbank.org

tools expo, part 2

Thursday, December 5, 2013, 1:30 – 2:30 pm

Room C1: Information Products, Part 2

Coupled Routing and Excess Storage (CREST) Hydrological Modeling Tool

Eric Kabuchanga, Regional Center for Mapping and Resource Development, kabuchanga@rcmrd.org
John Rao Nyaoro, Kenya Ministry of Water and Irrigation jrnyaoro@yahoo.com
About: Developed by SERVIR, a partnership between USAID and NASA, CREST is a hydrologic modeling tool that integrates satellite rainfall information with a number of variables to calculate actual evaporation, transpiration, soil moisture, and streamflow to make global and small-scale flood predictions. It aims to improve decision making in community development, environmental management, agricultural planning, and other areas.

The Extreme Climate Indices (EC) Map Room

Ángel Muñoz, International Research Institute for Climate and Society (IRI), agmunoz@iri.columbia.edu
About: EC allows users to compute and visualize several extreme rainfall and temperature indices, their probability distributions, and trends. The map room also offers an approximate timescale deconstruction of the past variation of selected indices in terms of long-term, decadal, and inter-annual signals.

Local Climate Analysis Tool (LCAT)

Presented by Meredith Muth, National Oceanic and Atmospheric Administration (NOAA). For more information, contact Marina Timofeyeva, NOAA, marina.timofeyeva@noaa.gov
About: LCAT is an online interactive tool that assesses local impacts of climate variability and change. LCAT is intended for technical users of climate information and comes in a package that includes help support, dynamic interpretation statements, and online training modules to maximize user experience.
Web link: http://nws.weather.gov/lcat/

The Annual Climate Explorer (ACE)

Teddy Allen, International Environmental Data Rescue Organization (IEDRO), teddy.allen@iedro.org
About: ACE is an interactive software package that automates the processing and display of a year-round climatological time series of observed and simulated datasets. The program is freely offered for popular computer platforms, and is a fully interactive software where users substitute command line coding for a simple point and click.

InStat

Clifton Wilson, ACDI/VOCA, cwilsonacdivoca@flowja.com
About: InStat Plus is a basic statistics package that includes a range of features to facilitate the processing of climatic data for decision making. InStat can be used to teach statistical concepts, and can also support data analysis across fields. In Jamaica, analyses were prepared regarding the occurrence/length of dry/wet spells and minimum/maximum temperatures; roughly 30 extension officers were trained to use InStat.

Room C2: Capacity Building

MetEd website

Emily CoBabe-Ammann, University Corporation for Atmospheric Research (UCAR), ecobabe@ucar.edu
About: MetEd is a collection of learning resources for the geoscience community, with specific focus on meteorology and climate. Materials include training courses, modules and webcasts that can be used for professional development, training and certifications.
Web link: https://www.meted.ucar.edu

Social Network for Index Insurance Design (SNIID)

Dan Osgood, International Research Institute for Climate and Society (IRI), deo@iri.columbia.edu
About: SNIID is a process meant to ensure the sustainability of an index insurance project, with farmer-driven, science-based educational activities and participatory design and validation processes. The SNIID tool includes software materials, activities, and timelines for a community of experts, partners, and clients to quantitatively develop and update an index, integrating it into complimentary project interventions.

Online Learning Platform – Hydromet and Climate Services: A Value Chain Approach to Project Design

Kanta Kumari Rigaud, World Bank, kkumari@worldbank.org
About: Hydromet and Climate Services: A Value Chain Approach to Project Design is an online learning platform meant to guide future planning and the implementation of hydromet and climate services (HCS) investments. It serves as a practitioners' tool on how to develop targeted HCS projects, integrate HCS into sector-specific projects, or address user-specific HCS needs, with a consideration of the whole HCS value chain.

Climate Concept for Development – Webinar Series

Walter Baethgen, International Research Institute for Climate and Society (IRI), baethgen@iri.columbia.edu
About: The International Research Institute for Climate and Society (IRI) and the U.S. Agency for International Development (USAID) have developed a new set of training webcasts geared for development professionals who want to be more fluent in the science that underpins their climate change adaptation projects.

Climate Attribution Under Loss & Damage: Risking, Observing, Negotiating (the CAULDRON Game)

Erin Coughlan, Red Cross/Red Crescent Climate Centre, coughlan@climatecentre.org
About: The CAULDRON game is an interactive tool that explores the role of scientific knowledge for decision making. The game is fast-paced - a serious though fun way to examine how information about risks and options can inform decisions. This innovative endeavor is the result of a collaboration between ACE-Africa (University of Oxford, AfClix, University of Reading, the UK Met Office, and partners) and the Red Cross/Red Crescent Climate Centre.

Room C6: Decision Support, Part 2

Caribbean Online Risk and Adaptation Tool (CCORAL)

Neville Trotz, Caribbean Community Climate Change Centre (5Cs),utrotz@caribbeanclimate.bz
Tyrone Hall, Caribbean Community Climate Change Centre (5Cs), thall@caribbeanclimate.bz
About: CCORAL is an online platform meant to encourage regional- and national-level decision makers throughout the Caribbean to incorporate climate information into their work. The tool promotes climate-smart development and resilience and can be used by government officials, the private sector, and non-governmental organizations.
Web link: http://ccoral.caribbeanclimate.bz/

mDSS (Mulino Decision Support System)

Valentina Giannini, Euro-Mediterranean Center on Climate Change (CMCC), valentina.giannini@cmcc.it
About: The mDSS is a generic Decision Support System (DSS) developed to assist decision makers in the management of environmental challenges. It can help users to explain challenges, explore possible solutions, facilitate public participation, and extend collaboration among stakeholder groups.
Web link: http://www.netsymod.eu/mdss/

Climate Proofing for Development

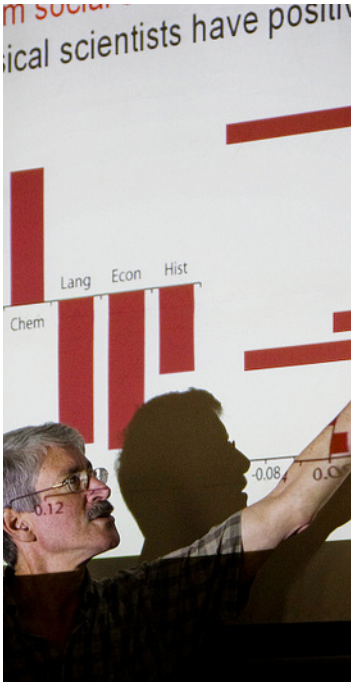
Eva Wuttge, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), eva.wuttge@giz.de
About: Climate Proofing for Development facilitates a climate-smart analysis of policies, projects, and programs at national, sectoral, project, and local levels. It incorporates climate information, uncertainty, and the biophysical and socioeconomic impacts of climate change in order to support the identification of appropriate adaptation strategies.
Web link: Approach: https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/ms/mainstreaming-guides-manuals-reports/gtz-climateproofing-td-2010-en(2).pdf Training Course: https://gc21.giz.de/ibt/var/app/wp342deP/1443/index.php/knowledge/cca-training/

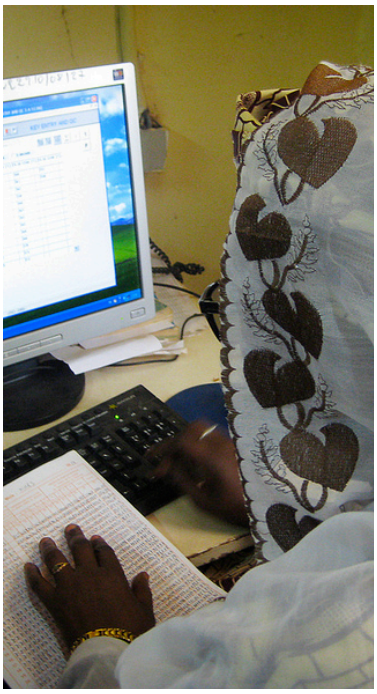
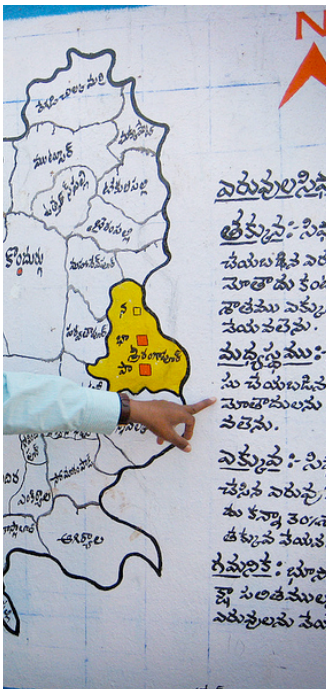
Assessing National Water and Climate Services: Utilization of the GFCS Framework in Canada

Jamie Smith, Environment Canada/Meteorological Service of Canada, jamie.smith@ec.gc.ca
About: The Global Framework for Climate Services (GFCS) provides a framework for categorizing important climate services. The methodology was tested in Canada and results suggest the “tool” is helpful for 1) optimizing services by reducing duplication; 2) creating a common understanding of water and climate services to inform improved coordination; and 3) identifying opportunities for improved sharing of climate information and products.

Regional Information System on Climate and Food Security (SIRCSAN)

Adriana Bonilla, Regional Committee for Hydraulic Resources (CRRH), adriana.bonilla@recursoshidricos.org
About: SIRCAN (Sistema de Información Regional sobre Clima y Seguridad Alimentaria y Nutricional) provides information regarding potential impacts and opportunities surrounding seasonal rainfall variability across Central America. SIRCAN is meant for decisions makers in the field of food security risk management. Eventually, SIRCAN will also collect user feedback, and connect users with information from the Central American Climate Outlook Forum.

tools training sessions

These longer sessions will give participants the opportunity to further explore a number of tools via a hands-on training experience.

Climate Prediction Tool (CPT)

Simon Mason, simon@iri.columbia.edu
International Research Institute for Climate and Society (IRI)
Wednesday, 2:00 - 5:30pm, Room C 4/5

About. The Climate Predictability Tool (CPT) provides a Windows package for constructing a seasonal climate forecast model, performing model validation, and producing forecasts given updated data. Its design has been tailored for producing seasonal climate forecasts using model output statistic (MOS) corrections to climate predictions from general circulation model (GCM), or for producing forecasts using fields of sea-surface temperatures. Although the software is specifically tailored for these applications, it can be used in more general settings to perform canonical correlation analysis (CCA) or principal components regression (PCR) on any data, and for any application.

Pre-training preparation. All participants should bring a laptop computer if possible.

Statistical modeling of malaria in Botswana using the R language for statistical computing

Rachel Lowe, rachel.lowe@ic3.cat
Institut Català de Ciències del Clima (IC3)
Thursday, 9am - 12:30pm, Room C 4/5

About: R is a language and platform for statistical computing and graphics. The tool offers a wide range of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, etc.) and graphical techniques, and its uses are extremely diverse. The objective of this exercise is to learn how to conduct a simple temporal climate and health analysis using the R. This exercise investigates the relationship between malaria

incidence and rainfall in Botswana (1982-2007) and discusses the application of climate forecasts in disease prediction and control. The malaria incidence time series is also used to discuss the long term trends in disease and vulnerability changes.

More on R: R general information: http://www.r-project.org/ R help search engine: http://www.rseek.org/
R user interface: http://www.rstudio.com/ R packages (CRAN): http://www.cran.r-project.org/

Pre-training preparation: Prior to the training, please download R and download RStudio via the links available in the ICCS 3 online agenda. All participants should bring a laptop computer if possible.

Quantum Geographic Information Systems (QGIS)

Jennifer Boehnert, boehnert@ucar.edu
National Corporation for Atmospheric Research (NCAR)
Thursday, 2:30 - 4:00pm, Room C 4/5

About. Climate and society are co-evolving in a manner that may place vulnerable populations at greater risk to weather and climate stresses. Understanding societal risks and vulnerabilities to weather hazards and climate change requires integration of spatial information from physical and social sciences. The GIS Program at the National Center for Atmospheric Research (NCAR) has developed research frameworks and spatial methods for the integration of diverse, multidisciplinary datasets, which are both quantitative and qualitative and exist at different spatial and temporal scales. The GIS program at NCAR fosters interdisciplinary science, spatial data interoperability, and knowledge sharing using GIS technology. The goal of our program is to promote and support the use of GIS as both an analytical and infrastructure tool in atmospheric research. Our program has focused on the integration and analysis of climate model output with traditional GIS data, such as, socio-economic and infrastructure data, in order to facilitate interdisciplinary research and decision making. Quantum GIS (QGIS) is an Open Source user-friendly GIS application which provides a number of visualization, data management, data analysis, and map composition tools. GIS is an excellent tool for performing analysis as well as communicate research results.

Pre-training preparation. Please download QGIS before the training; download instructions can be found under the QGIS Training link of the ICCS 3 agenda. All participants should bring a laptop computer if possible.

Caribbean Online Risk and Adaptation Tool (CCORAL)

Keith Nichols, knichols@caribbeanclimate.bz
Caribbean Community Climate Change Center (5Cs)
Thursday, 4:30 - 6:00pm, Room C 4/5

About: CCORAL is an online support system that facilitates climate-smart development by promoting the incorporation of a risk management ethic in decision-making processes throughout the Caribbean. The tool is intended to be used primarily by governmental agencies at the regional and national level responsible for development, planning, and finance, in addition to users in the private sector and non-governmental organizations. Ministries of Finance and/or Planning have been central to the initial efforts to launch CCORAL, though civil society organizations, universities, financial services, development partners, and local communities can also use the platform to inform actions concerning the climate system. CCORAL emerged following extensive consultation with regional stakeholders to ensure authenticity, relevance, and local ownership. It is a direct response to the Regional Framework for Achieving Development Resilient to Climate Change (the “Regional Framework”) and the landmark Implementation Plan (IP). Both were endorsed by CARICOM heads in 2009 and 2012, respectively. CCORAL was developed by the Caribbean Community Climate Change Centre with funding from the United Kingdom Department for International Development (DFID) and the Climate Development and Knowledge Network (CDKN).

More on CCORAL:
http://ccoral.caribbeanclimate.bz/
http://200.32.211.67/M-Files/openfile.aspx?objtype=0&docid=5599
http://200.32.211.67/M-Files/openfile.aspx?objtype=0&docid=5598

Pre-training preparation: All participants should bring a laptop computer if possible.

Appendix 5: Training sessions feedback

Caribbean Online Risk Management Tool

What is your area of work?

Area of Work	Number of Respondents
User	3
Provider	3
Researcher	0
Donor	3
Capacity Building	1

How would you rate the length of time allotted for this training?

Rating	Number of Respondents
Too short	1
	0
	3
	1
Too long	3

How would you rate the trainer for this session?

Rating	Number of Respondents
Poor	0
	2
	3
	3
Excellent	0

How would you rate the content of this session?

Rating	Number of Respondents
Poor	0
	1
	3
	4
Excellent	0

Is this tool applicable to your work?

- Yes, evaluating grant applications from communities.
- Yes, for project preparation activities in area of work.
- Yes, evaluation of policy, programmes to be implemented It could be used to train students in analyzing projects re: climate change impacts / adaptability.
- Yes I don't work directly in climate services investments, but I support knowledge management / learning activities and thus am interested in this tool.
- Could be. Like a model for do something like that in our region.

Have you had any exposure to this tool prior to this training session? If so, please explain.

- Yes, observed a demonstration before.
- No.
- Yes, from the listserv.
- No, I have not.
- Briefly reviewed it. No.
- No, I did not.

Did this training add to your overall conference experience? Please explain.

- Yes, very useful to have this session.
- Yes, looks like a very useful tool for preparing proposals.
- Yes, broadened understanding for tool application.
- So-so. Training in principle is a great idea, but this training was too long, room was too big, and it was not sufficiently interactive.
- Yes.
- Yes, I like to know what are the advanced in the area about the relation between met services and users.
- Yes, it provided a tool to assist in decision making.
- Yes, I will explore it further.

Climate Predictability Tool

What is your area of work?

Area of Work	Number of Respondents
User	3
Provider	4
Researcher	2
Donor	1
Capacity Building	0

How would you rate the length of time allotted for this training?

Rating	Number of Respondent
Too short	1
↕	0
	2
	2
Too long	0

How would you rate the trainer for this session?

Rating	Number of Respondents
Poor	0
↕	0
	0
	0
Excellent	4

How would you rate the content of this session?

Rating	Number of Respondents
Poor	0
	0
	0
	1
Excellent	4

Is this tool applicable to your work?

- I can provide a better product to users.
- Yes, to test and evaluate models.
- Also, to visualize data, like EOFs, comparison for forecasts and observed data, etc.
- Yes, I can use it to forecast drought, rainfall, number of dry days or wet days, likelihood of rainfall exceeding some threshold.
- Yes
- Yes, especially the drought & precipitation, probabilistic, maps, series, SPI, etc.

Have you had any exposure to this tool prior to this training session? If so, please explain.

- No.
- Yes, I used this tool in my work every month.
- Yes, at the previous training session, but with an older model.
- No.

Did this training add to your overall conference experience? Please explain.

- Yes, I have learned of additional tool that can be used professionally.
- Is an interesting tool, and the people who explain is the best.
- Very much so -- it allows for hands-on experience broken down in understandable terms so that you are able to work with it immediately.
- Yes.
- Yes, introduce a new tool to me that is in the area of study.

Additional comments.

- May be wise to embark on some country / national training along with regional partners training awareness sensitization initiatives.

Quantum Geographic Information Systems

What is your area of work?

Area of Work	Number of Respondents
User	5
Provider	5
Researcher	7
Donor	0
Capacity Building	0

How would you rate the length of time allotted for this training?

Rating	Number of Respondent
Too short	3
	2
	5
	0
Too long	1

How would you rate the trainer for this session?

Rating	Number of Respondents
Poor	0
	0
	0
	2
Excellent	9

How would you rate the content of this session?

Rating	Number of Respondents
Poor	0
	0
	0
	2
Excellent	8

Is this tool applicable to your work?

- Is it. Since its very friendly, it may help to spatially express the climatic and weather. subjects, making them more accessible for communication purposes with non-climatic practitioners and communities.
- Yes, the spatial distribution of precipitation data is necessary for studying drought.
- Yes, it a tool that I need for make better presentation of the information.
- Yes, possible use in hurricane data analysis.
- No.
- Very much; it can be used to show climate parameters such as rainfall distribution.
- Yes, I am interested in data management and want to learn how to use GIS as a tool to help communicate social impacts of climate variability and change.
- Yes, I can use it to forecast drought, rainfall, number of dry days or wet days, likelihood of rainfall exceeding some threshold.
- Yes, it can be used to spatially represent and manipulate water resources data.
- Yes, visualization and integration of data.
- Yes, used for climate data analysis can also be used for water resources and agricultural planning.

Have you had any exposure to this tool prior to this training session? If so, please explain.

- No.
- No, never heard of it.
- Yes, at the previous training session, but with an older model.
- No.
- No, I didn't.
- No, I have used GIS briefly in a course during my undergrad but now understand the software and its applications much better.
- No.
- Nope.

Did this training add to your overall conference experience? Please explain.

- Certainly. Very useful introduction, thorough and efficient learning exercise. I now have the confidence to do more exercises on my own.
- Yes, I am not knowledgeable about QGIS and more confident in my ability to use it.

- Yes, it gave good hand-on training which I can take away and work with immediately as well as share with colleagues.
- Yes, it gave me added skills to conduct the research that I do, and which the conference motivated me to keep doing.
- Very much so -- it allows for hands-on experience broken down in understandable terms so that you are able to work with it immediately.
- Yes, introduce this tool which is usable in my field.
- Yes!
- Isn't important to know a new tool free and to meet people who can help with knowledge.
- Yes.
- Yes, build capacity and exposure to new tools available.

Additional comments.

- Great training.
- I very much appreciated the session leader's preparedness. Since the internet was foul, she had the software installation and data files on a USB that was shared among participants. Also, she had exercise booklets with step-by-step instructions that we were allowed to take home!

R Project for Statistical Computing

What is your area of work?

Area of Work	Number of Respondents
User	3
Provider	6
Researcher	4
Donor	0
Capacity Building	0

How would you rate the length of time allotted for this training?

Rating	Number of Respondent
Too short	2
	3
	4
	0
Too long	0

How would you rate the trainer for this session?

Rating	Number of Respondents
Poor	0
	0
	0
	0
Excellent	9

How would you rate the content of this session?

Rating	Number of Respondents
Poor	0
	0
	0
	1
Excellent	8

Is this tool applicable to your work?

- Yes, I have a good start now.
- Yes. similar tool to Matlab but free. Seems more user friendly.
- Yes, statistical analysis of health data with climate variables.
- Yes, it is. Because it can work with all sorts of series and subjects. Is a new option for present our data to users and we can make a relation between two vectors.
- Yes, allows for climate research and presentation.
- Yes, and this is because I come from East Africa, region prone to malaria caused by several factors. The tool can be used to analyze other phenomena like Rift Valley Fever.
- Yes, research focuses on the statistical modeling of hurricane frequency and intensity.

Have you had any exposure to this tool prior to this training session? If so, please explain.

- No.
- No, I have not.
- Yes, through personal interest.
- No.
- None,
- No, mostly worked with Matlab.
- Yes, R Climdex Extra 9c.

Did this training add to your overall conference experience? Please explain.

- Yes, it a new tool that we can apply.
- Yes, it did as a practical component.
- Yes, it was one of the primary tools of interest at the conference.
- Yes, add a new tool to my knowledge.
- Yes, the training made R easier to use and provided links to useful sources.
- Yes, it has build my capacity for producing user-friendly products This was a great training. Rachel did a great job at introducing the tool.
- Yes, and I generally see I have insight in applying the tool for spatial and statistical analysis.
- Yes, but lack of internet delayed the exercise.

Additional comments.

- Good teacher. Add spatial component to the next training.

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